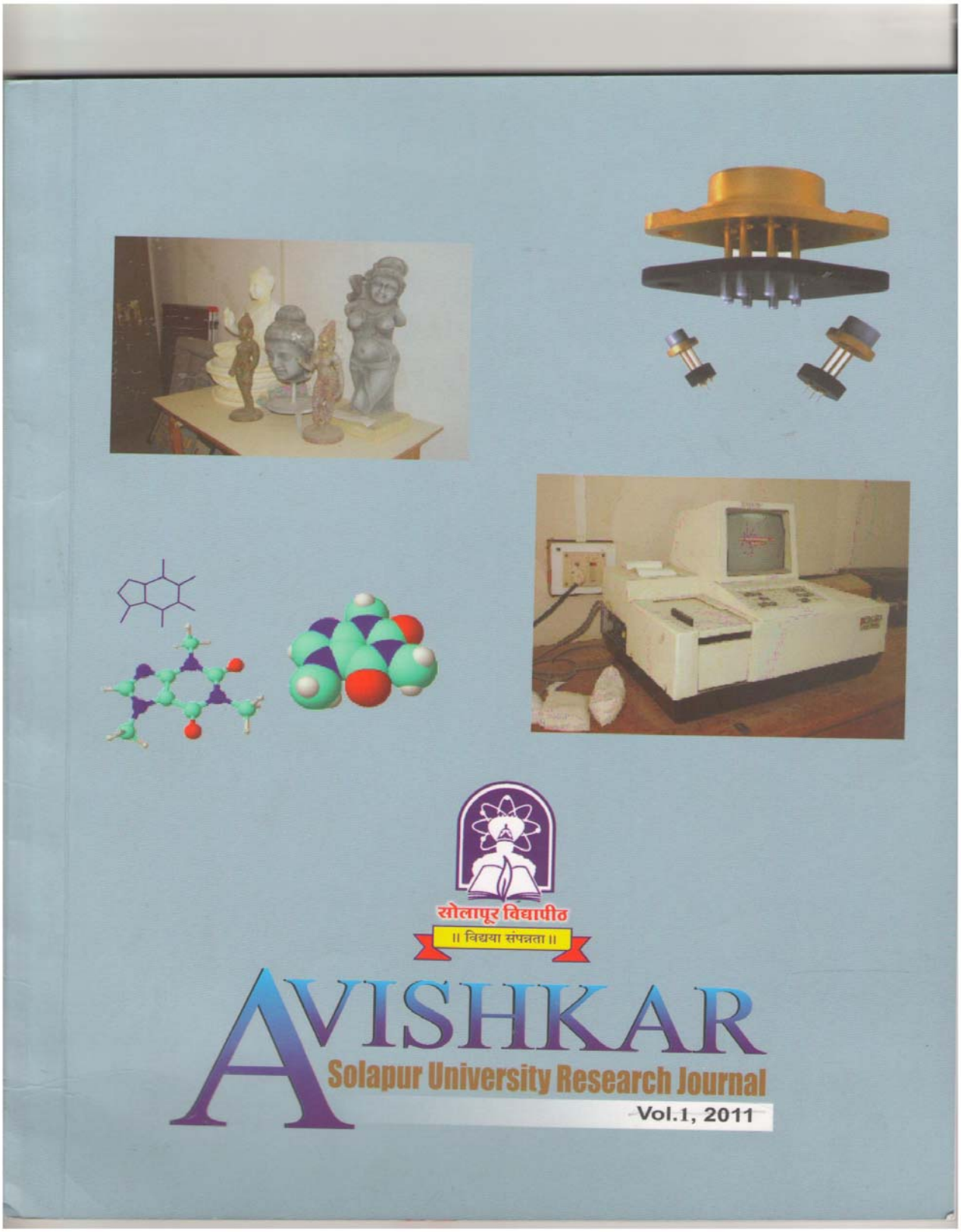
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AVISHKAR
Solapur University Research Journal
Vol.1, 2011

Published By : **Rajendra N. Shendage**
Director, B. C. U. D., Solapur University, Solapur

Printed By : **Regal Printing Press**
98, Sakhar Peth, Solapur. 0217-2624651

MODEL FIT ANALYSIS OF INTEGRATED MANUFACTURING PROGRAM USING STRUCTURAL EQUATION MODELING

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Abstract

The conceptual and empirical literature on joint implementation supports the close interaction among Just-in-Time (JIT), Total Quality Management (TQM), Total Productive Maintenance (TPM), Supply Chain Management (SCM), and Enterprise Resource Planning (ERP). In this paper, more holistic approach of 'Integrated Manufacturing Program' based on the synergistic implementation of these paradigms is proposed within a single framework. The proposed framework is empirically tested for the fit using the data of 153 Indian manufacturing industries. The fit by covariation approach using Structural Equation Modeling (SEM) is used. The second-order factor model has satisfactory fit indices which provide the statistical evidence to the rationale of 'Integrated Manufacturing Program'.

Keywords JIT, TQM, TPM, SCM, ERP, SEM

Introduction

Improving manufacturing performance for sustainable competitive advantage has been and continues to be an ongoing concern for modern manufacturing. Over the years, several operations paradigms, initiatives, and practices like Just-in-Time (JIT), Total Quality Management (TQM), Total Productive Maintenance (TPM), Supply Chain Management (SCM), and Enterprise Resource Planning (ERP) etc. have emerged. These paradigms have received particular attention in both academic and practitioner community. Each copes with the issue of improving the overall performance, based on a particular viewpoint and logic, which originated a rich set of practices and tools. Many researchers have addressed the concepts, critical success factors, implementation and empirical surveys. These paradigms complement each other by reinforcing mutually, inducing side-effects in favor of other paradigm's, mutual stimulation and exploitation of shared values. The recent literature reports the discussion on joint implementation. These researches on joint implementation includes JIT and TQM [1, 2]; TPM and TQM [3]; JIT, SCM and TQM [4]; JIT, TQM and TPM [5, 6]; JIT and SCM [7]; TQM and SCM [8]; SCM and ERP [9]; TQM and ERP [10, 11]; SCM and ERP [12]; TPM and ERP [13]; and JIT and ERP [14]. The cited authors and others have recognized that manufacturing competitiveness is based on foundation of integrating and overlapping practices, which forms the basis for pursuing superior performance in manufacturing. Linking one paradigm to another will enhance manufacturing performance.

Development of "Integrated Manufacturing Program" Model

The empirical studies of Cua et al.[5] and Miyake et al.[6] have concluded that the manufacturing plants that are identified as high performers have implemented practices from all the three paradigms of TQM, JIT and TPM rather than from only one paradigm. But they have not considered SCM in their framework. The other studies have identified the strong linkage between TQM and SCM and have advocated the joint implementation[8]. Kannan and Tan[4] have investigated the effect of joint implementation of JIT, TQM and SCM and found that the simultaneous implementation leads to overall improvement in performance measures. The positive impact of joint implementation of TQM and TPM on manufacturing performance has been also investigated[3]. Bamber et al.[15] have considered TPM as an integral part of any JIT manufacturing. ERP automates and integrates an organisation's business process. It fulfils real-time information requirements of JIT, TQM, TPM and SCM. Detailed discussion on joint implementation of these paradigms is provided byWakchaure et al.[16]

In spite of all these combinations, broader perspective is still missing. The literature provides the strong grounding for joint implementation of JIT, TQM, TPM, SCM and ERP. And there is clear void in the extant manufacturing management and improvement literature. Plant managers are interested in the implementation of best manufacturing practices to enhance performance. Aiming to foster the development of a broader perspective so as to face the challenge of enhancing the overall performance, we suggest a more holistic approach of 'Integrated Manufacturing Program' in which patterns derived from earlier paradigms discussed here are concatenated. Fig.1 depicts the framework of 'Integrated Manufacturing Program'.

From the theoretical and practical evidences of complementary nature of practices of JIT, TQM, TPM, SCM and ERP, we propose the following.

Proposition: The practices associated with JIT, TQM, TPM, SCM and ERP should form an integrated set of manufacturing practices to achieve the internal fit.

This proposition can be empirically tested using the fit as the practices of these programs are correlated and are dimensions of a single factor. Considering the overlap of the paradigms, the consistency of the practices can be examined using sets of common practices and basic techniques. The empirically testable hypothesis can be stated as

H1: The common practices and basic techniques of JIT, TQM, TPM, SCM and ERP are dimensions of a single factor signifying integration of practices.

Data for Empirical Analysis

The standard instruments available in the literature [5, 17-19] were used to develop the survey instrument and then validated in pilot survey of 17 manufacturing companies. The survey questions applicable to this study are interval Likert scales. The survey questionnaire itself was broken down into three sections: 1) Demographics and products: size of the firm, type of operation, industry sector, product type, production complexity etc. 2) Extent of practicing the elements of these paradigms: The five-point Likert scale was developed to seek the response on the extent of practicing the elements and 3) the performance of the firm compared to the competitors**.** The pre-coded questionnaire was sent to 400 manufacturing firms located all over India. 153 responses (Response rate= 38.25%) to this questionnaire were obtained. The profile of the respondent is as given in Table. 1.

Table 1. Profile of the respondents

Scale	Automobile	Machine tools, industrial goods	Electrical/ Electronics	Steel/ Process	Total
Large	36	21	8	3	68
Medium	22	13	5	0	40
Small	18	16	11	0	45
Total	76	50	24	3	153

Method of Analysis

When fit is modeled as covariation, the recommended method of analysis is exploratory or confirmatory factor analysis. Exploratory factor analysis (EFA) is designed for the situation where links between the observed and latent variables are unknown or uncertain. In contrast to EFA, confirmatory factor analysis (CFA) is appropriately used when the researcher has some knowledge of the underlying latent variable structure. Based on knowledge of the theory, empirical research, or both, the relations are postulated between the observed measures and the underlying factors a priori and then tests this hypothesized structure statistically. It takes a confirmatory rather than an exploratory approach to the data analysis. The CFA approach using Structural Equation Modeling (SEM) is used in this research work. Various theoretical models can be tested in SEM that hypothesizes how sets of variables define constructs and how these constructs are related to each other. It permits complex phenomena to be statistically modeled and tested. SEM techniques are therefore becoming the preferred method for confirming (or disconfirming) theoretical models in a quantitative fashion. In this approach, the theoretical model is either accepted or rejected based on meeting acceptable model fit criteria[20]. In general,

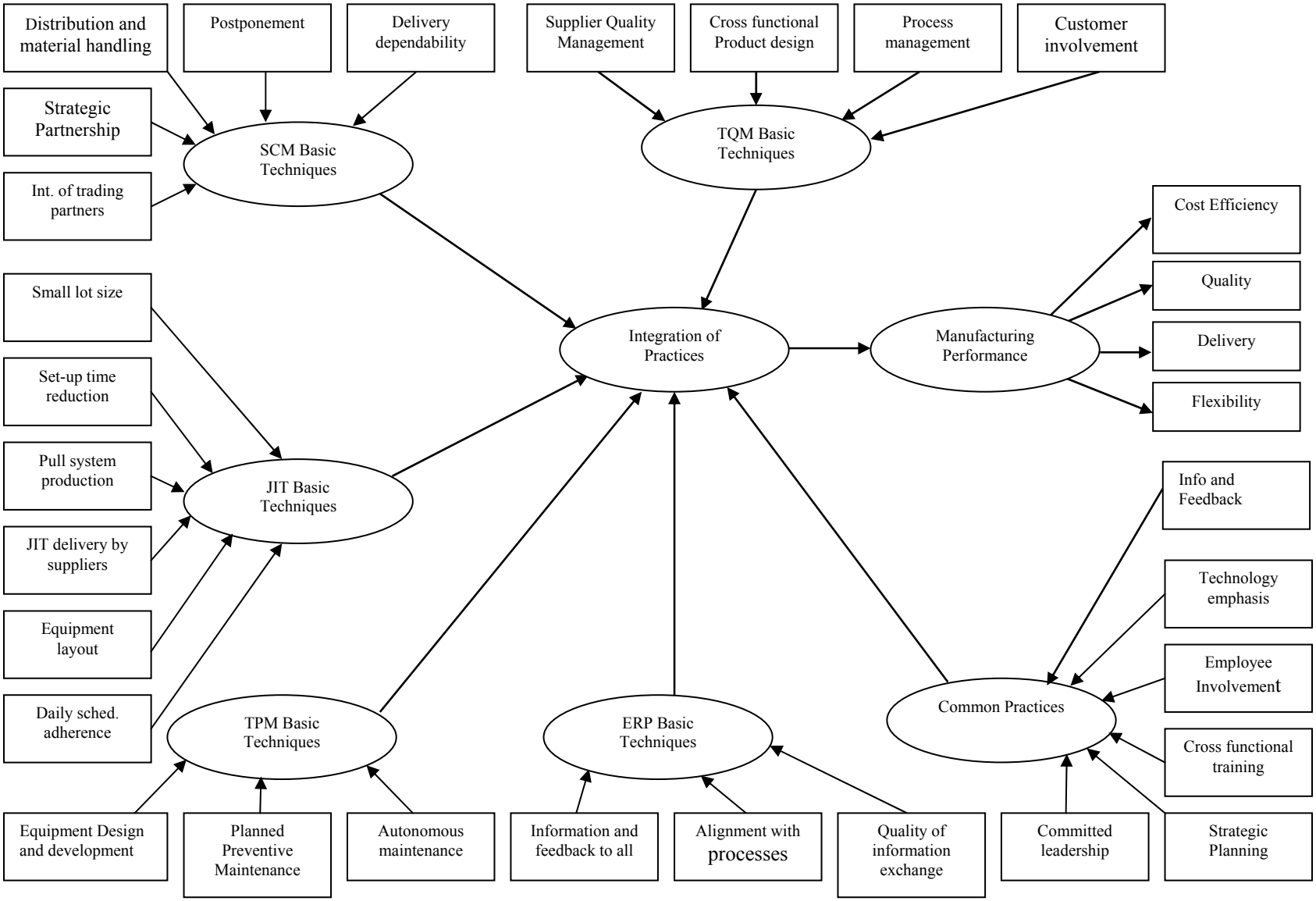


Figure1 Framework of Integrated Manufacturing Program

fit means consistency of two or more factors and it is believed that a good fit among relevant factors will lead to better performance.

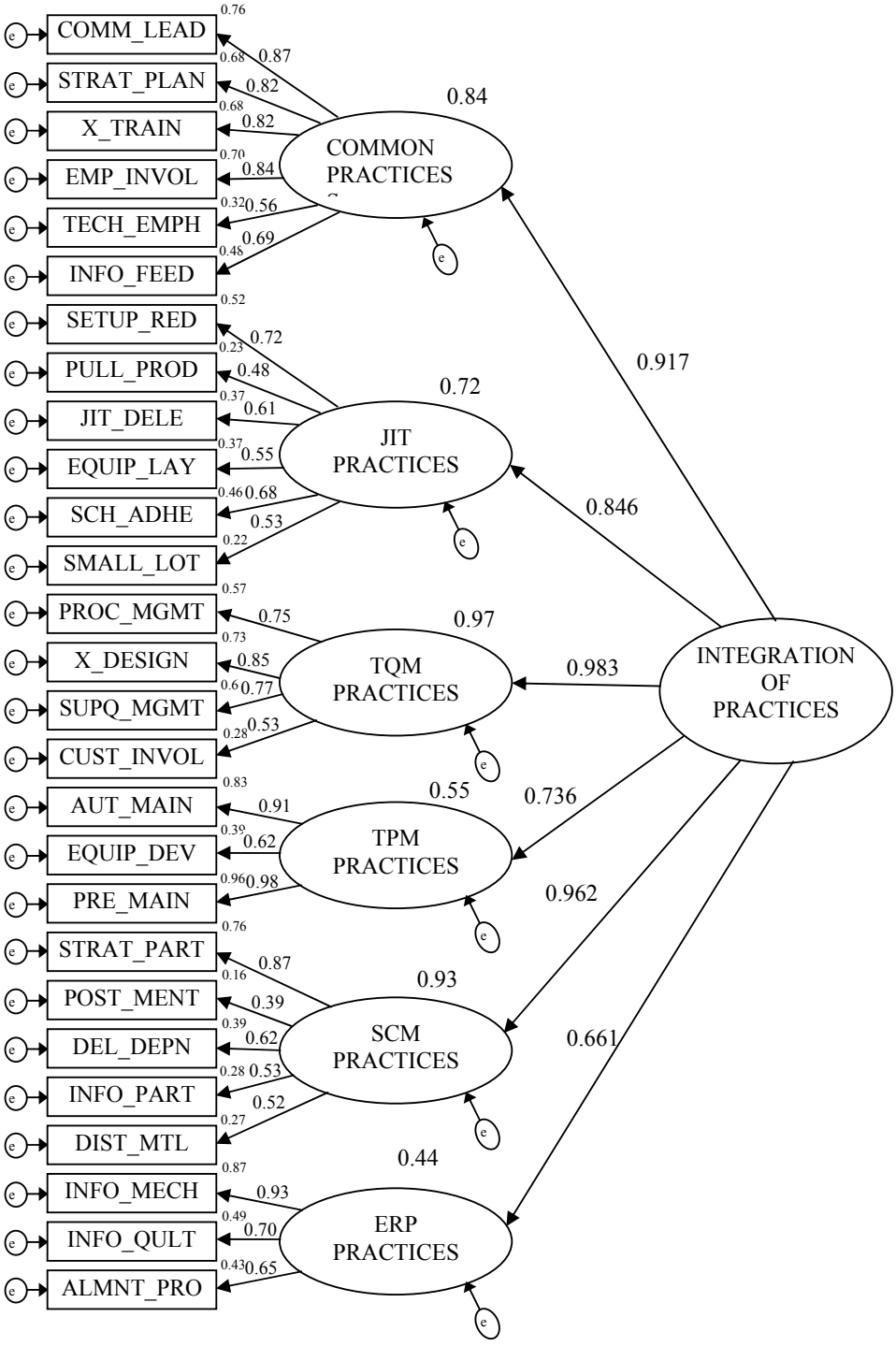
To provide a more comprehensive model assessment, different types of fit indices like absolute, relative and parsimonious indices are available. Normed chi-square, Root Mean Square Residual (RMR), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Bozdogan's Consistent Akaike's Information Criterion (CAIC) and Parsimonious Normed Fit Index (NFI) are considered in this study as these indices appropriate for small samples (below 200). The model fit is assessed by using a combination of these indices and by examining residual.

Results of Analysis

The conceptual and empirical literature on joint implementation supports the close interaction among JIT, TQM, TPM, SCM and ERP. To empirically test the fit of these paradigms within a single framework, the fit by covariation approach is adopted. The second-order factor model has acceptable fit (e.g. Chisq= 675.08, GFI= 0.7597, NFI= 0.7423, RMR= 0.0748, CFI= 0.8335, PNFI=0.6139, CAIC = 1232.14) as shown in the fig.2. Also for the overall integration of practices, the loadings are more than 0.65. The loadings for the common practices are well above 0.65 except the factor technology emphasis. This may be because of the fact that specific technology required in implementation of these paradigms differs. In TQM, the factors like process management, cross functional design and supplier management have significant loadings except customer involvement. Set up time reduction, schedule adherence and JIT delivery has higher loading for JIT practices. All the TPM and ERP practices have considerable loadings. In SCM practices, postponement has low loading as compared to other practices. However, the lower loading of few practices of all paradigms signifies that it may not be necessary for good performance but may be a significant factor for achieving competitive advantage.

Conclusion

The conceptual and empirical research literature on joint implementation of JIT, TQM, TPM, SCM and ERP provides sound theoretical basis for complementary application of these paradigms. The proposed 'Integrated Manufacturing Program' fills the void in performance improvement literature by considering all the paradigms in a single framework. The second-order factor model has satisfactory fit indices which provide the statistical evidence to the rationale of using proposed 'Integrated Manufacturing Program'. Further analysis should be able to find out the relationship of integration of practices with the measures of business performance like cost, quality, delivery and flexibility.



Model Fit statistic
Chi-square = 675.08, Degrees of freedom (Df) = 316, Goodness-of-fit (GFI) = 0.7597, Root-mean-square residual (RMR) = 0.0748, Root-mean-square error of approximation (RMSEA) = 0.098 Bentler & Bonett's Normed fit index (NFI) = 0.7423, Bentler's Comparative Fit Index (CFI) = 0.8335, Parsimonious Normed fit index (PNFI) = 0.6139, Bozdogan's CAIC = 1232.1450

Figure 2 Second-Order Factor Model of Integration of Practices

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CACHES IN UNIPROCESSOR AND MULTIPROCESSOR ARCHITECTURES

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Abstract

Memory is an important and integral part of any microprocessor architecture: Uniprocessor or multiprocessor. This paper takes in to account both the architectures. In Uniprocessor, main issue about cache is to organize and map with reference to main memory for maximum hit ratio. In multiprocessor, caches revolve around coherence. For Uniprocessor, research work is carried out to form optimum organization of cache by simulating superscalar processor on a simulator tool "SimpleScalar-2.0". Various work benches are used to find out the optimum organization to give the best possible performance in any application. The main performance metrics used are Instructions Per Cycle (IPC) for overall performance of processor architecture and hit (miss) ratio for cache organization. Multiprocessor architectures fall mainly in two categories: Centralized Shared Memory (CSM) and distributed memory architectures. However, in practice, an integrated version of both " Distributed Shared Memory (DSM)" architecture is more commonly used, so this type is considered in this paper.

Keywords Superscalar architectures, cache mapping, miss ratio, IPC, multiprocessor architecture, cache coherence.

1. Introduction

Superscalar architecture

Superscalar architecture is capable of issuing and subsequently executing more than one instruction in the same clock cycle[1]. This requires

i. Prefetching more than one instruction,

ii. Predecoding them,

iii. Sorting them according to various dependences,

iv. Resolving the dependences,

v. Simultaneously picking up the instructions in an 'out of order' fashion for execution,

vi. Reordering them to maintain sequential nature required in cases like interrupt.

The steps are detailed in Figure 1.

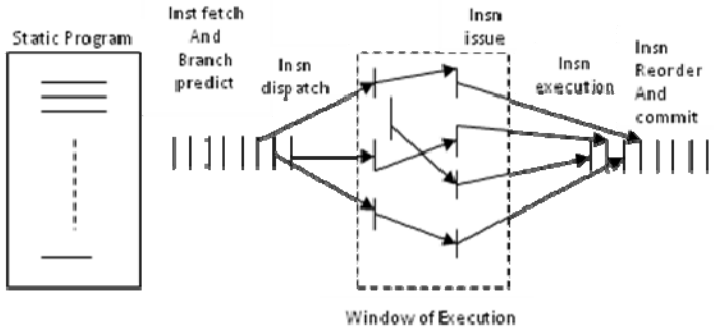


Figure 1 Processing Phases of Superscalar Execution

There are three main factors, which come in way to achieve the highest performance of a superscalar processor. Those are:

i. Data dependences,

ii. Control dependences,

iii. Memory cycle time / memory latency.

All the factors affecting performance are discussed in brief. Throughout the discussion, a pipelined architecture is presumed

1.1 Data Dependences

Superscalar architectures implement an 'out-of-order' execution. In some cases it is possible that two or more instructions may access (read/write) the same location (reg / mem). When instructions reference the same storage location, it is said to produce 'DATA HAZARD'[1] Such three types of data hazards are present (Figure 2).

i . RAW : Read After Write

ii. WAR : Write After Read

iii . WAW : Write After Write

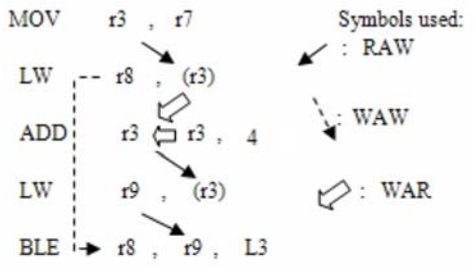


Figure 2 Illustration of Data Dependences

Out of the three data dependences, RAW is called as true dependency, because it cannot be removed by any method. e.g. in instructions 1 and 2 in the example, the latest value of r3 is available only after it is written in instruction 1.

As for WAW, instructions 2 and 5 use the same register r8 for writing whereas WAR is generated due to instructions 2 and 3 as the same register r3 is written after it is read in instruction 2. WAW and WAR are known as artificial dependences, because they can be resolved by using standard resolution methods[1].

The most popular method is 'Register renaming method'. In this method, registers reused in WAR and WAW dependences are renamed with physical registers. A separate set is maintained for this purpose.

1.2. Control Dependences

Control dependence problem arises due to branch instructions. There are many resolution methods on control hazard problem. One common factor in the resolution method is to predict the branch outcome and maintain the flow of the program according to the predicted outcome. Intensive research is going on, on this problem, even today. The reason is that a misprediction causes heavy penalty in the form of pipeline flush or pipeline stall, so, many cycles are wasted. In SimpleScalar, five resolution methods are facilitated[2]. Out of these five methods, two are static(Static methods are dealt with by the compiler) and three are dynamic (Dynamic branch prediction methods are resolved with hardware during run time) In dynamic resolution, the prediction depends on the past history and the current execution of the program. The methods are given in Table 1.

Table 1 Branch Prediction Schemes in SimpleScalar

Sr. No.	Name of Scheme	Type
1	Taken	Static
2	Nottaken	Static
3	Bimod	Dynamic
4	2lev	Dynamic
5	Comb	Dynamic

1.3. Memory Latency

In superscalar processors, normally two/ three - level caching exists. It is on chip. Usually primary cache (L1) is small and directly mapped. Secondary cache is larger and set-associatively mapped. The main metric used to test performance of any memory organization is Miss Ratio.

To get the best performance, cache configuration must be very properly selected. So, the performance of cache hierarchy with reference to superscalar processor is analyzed and cache configuration giving optimum performance is suggested.

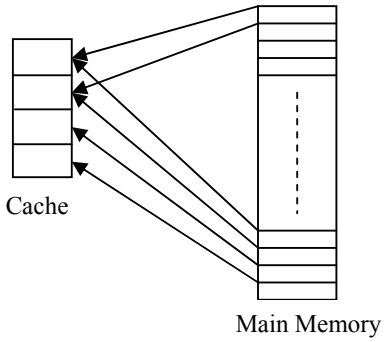
2. CACHE ORGANIZATION

Cache contains some portion of main memory. The required portion of main memory is mapped on to the cache. Both main memory and cache are divided into number of blocks of equal size (This may not be equal to page size). Each block contains number of lines (or words). The number of lines is known as block size. Main memory is mapped on to the cache by one of the following three methods:

1. Direct mapping
2. Fully associative mapping
3. Set associative mapping

These are briefly explained here.

2.1 Direct Mapping



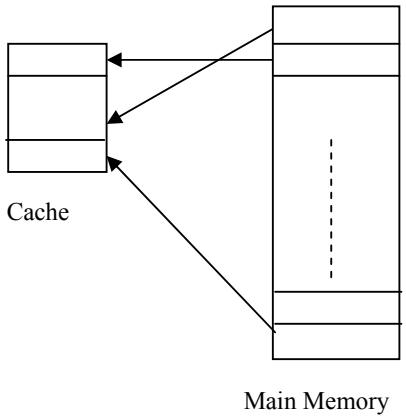
As shown in Figure 3, direct mapping allots a fixed block of cache to a block in main memory. e.g. if there are 4 blocks in cache, then the first four blocks of main memory will be allotted to the four blocks of cache respectively. The fifth block will again be allocated / mapped to the first block of cache replacing the earlier block automatically.

Figure 3. Direct Mapping

2.2 Fully Associative Mapping

As shown in Figure 4, fully associative mapping of main memory allows a block of main memory to reside on any block of cache

2.3 Set Associative Mapping

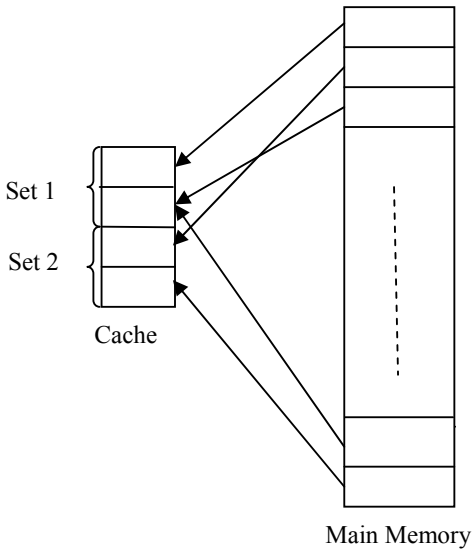


Set associative memory is an integrated version of direct and fully associative memory. As in direct mapping, every successive block will be allocated to the next set (In direct, it is allocated to next block). A set consists of 2^n blocks. A block of main memory will point to only set and the block can be inserted anywhere in that set. While searching for block in the set, it will be searched associatively (Figure 5).

Figure 4. Fully associative mapping

2.4 Replacement Policies : A cache design has to take in to account a preplanned replacement policy. Usually either FIFO or LRU will be selected.

FIFO: First In First Out: A block of main memory will choose the earliest entered block for replacement.



LRU: Least Recently Used: A block of main memory will choose the least recently used block for replacement.

Note that in direct mapping, replacement policy has no part, since each main memory block is mapped on to the fixed cache block.

Most microprocessors practically opt for LRU, however, our research has revealed that FIFO gives equally good performance. The research work carried out in the present investigation is described in the following sections.

Figure 5. Set Associative Mapping

3. Experimental Analysis Of Cache Organization

3.1 Benchmark selection to carry out the analysis

Initially, several simulation runs were taken to decide the appropriate benchmarks that have an effect on performance and resultant parameters. From this analysis, the areas were decided to consider for further experimentation, care has been taken to select the areas such that they will be representative enough to cover a wide range of applications. The areas decided are as follows:

1. Data structures
2. Operating systems
3. Numerical programs

Total 26 programs were chosen for final analysis. For a uniprocessor system, these workloads prove to offer adequate variety.

1.2 Tool used:Simplescalar-2.0

SimpleScalar 2.0 is a freeware tool used to build and test various uniprocessor architectures[2]. In this research work, various architectures provided in the tool were used. Finally, it was decided to carry out the work using simulator sim-outorder. This simulator simulates superscalar architecturee.

3.3 Experimental Set Up

Benchmark is selected from one of the 'C' programs falling in one of the areas decided. This is compiled on the compiler provided by SimpleScalar i.e. sslittle-na-sstrix-gcc. It is GNU gcc compatible. Let us concentrate on memory analysis.

3.4 Specifications of Parameters in SimpleScalar Required for Cache Analysis

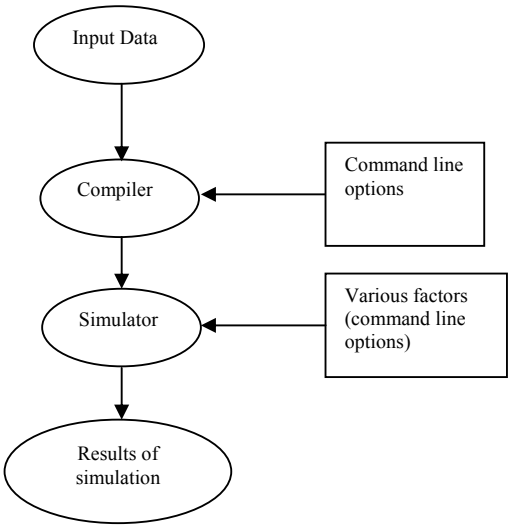


Figure 6 Experimental Setup for Research Work

By default, SimpleScalar supports separate instruction and data caches at first level and a unified cache at the second level. The same is accepted in our work.

The nomenclature of caches in SimpleScalar is as follows:

Level 1 instruction cache: il1

Level 1 data cache: dl1

Level 2 unified cache: ul2

The default settings of different parameters stated above are tabulated in Table 2.

The readings of the benchmarks are taken with default as well as many other configurations to decide the optimum performance. At a time one cache configuration will be varied with others kept at their default values.

Table 2 Default Parameter Settings of Cache Organization in SimpleScalar

Sr No	Parameter	il1	dl1	ul2
1	Number of sets	256	256	1024
2	Block size	32	32	64
3	Associativity	1	1	4
4	Replacement policy	lru	lru	lru
5	Total cache size	8K	8K	256 K

4. Analysis of Cache Hierarchy

In this section, we describe the actual investigation. Some sample cases were taken and the results give many result factors. The important one for us is of course 'miss ratio'. The other factors give us more information related to cache performance e.g. total number of accesses, hits, misses, replacements, writebacks and invalidations along with the ratios. Replacements tell us that how many misses are replaced. Invalidations tell us that an invalid access has taken place means either for the reason of wrong address calculation or may be due to some other reason.

Out of all these, the most important is miss ratio, so for analysis this factor is used. This may be sufficient to design a cache. But this is not enough to judge the overall performance. Because the cache configuration that gives good IPC is equally important as a cache giving a low miss ratio. So, first we consider miss ratios. Later on we take into account IPC for different settings of caches.

4.1 Analysis of Cache Hierarchy Using 'MISS RATIO' as Performance Metric for IL1

We start the analysis from the default mode of level 1 cache i.e.

Number of sets = 256, Block size = 32,

Associativity = 1, Replacement policy = LRU.

Size of cache = (no. of sets) * (blk. Size) * (assoc.)

Therefore, default cache size = 256 * 32 * 1 = 8192 = 8K.

Table 3 shows the results of large workloads.

Table 3. Miss Ratios of LARGE Workloads for Different Cache Sizes of IL1

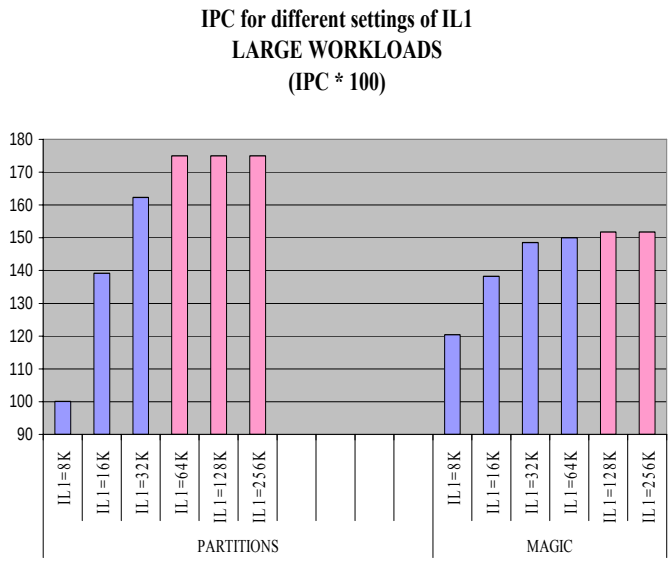
	PARTITIONS IL1 MISS * 100	**MAGIC** IL1 MISS * 100
IL1=8K	4.1	3.4
IL1=16K	4.09	1.61
IL1=32K	4.09	1.61
IL1=64K	4.09	1.61
IL1=128K	4.09	1.61
IL1=256K	4.09	0

From the table, the size of cache il1 can be fixed to be 64K. Similar analysis was carried out for DL1 and UL1. The sizes for all caches were fixed up as follows:

il1 = 64K **dl1 = 16K** **ul2 = 128K**

We turn to cache performance considering parameter IPC.

4.2 Analysis of Cache Hierarchy using 'IPC' as Performance Metric



We judge the overall performance in this section with variation in cache sizes. We then finalize configuration for the first and second level caches. Figure 7 shows IPC analysis for IL1.

The analysis of Figure 7 results in the level 1 instruction cache size as 64K which gives optimum result.

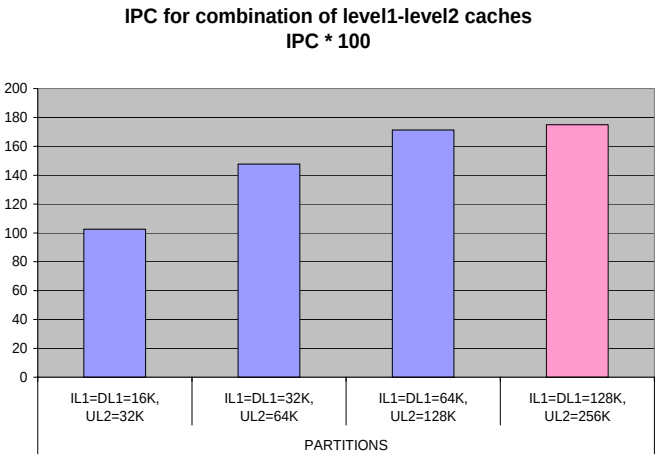
Similar analysis was carried out for DL1 and UL2.

Figure 7 IPC for Different Settings of IL1 for LARGE Workloads

The results are tabulated in Table 4 for Miss Ratio and IPC.

Table 4 Comparison of Cache Sizes For 'MISS Ratio' and For 'IPC'

Cache	Lowest 'miss ratio'	Highest IPC
Il1	64K	64K
Dl1	16K	64K
Ul2	128K	128K



Comparison of the two gives the optimum table as follows:

Level 1 instruction cache = il1 = 64K

Level 1 data cache = dl1 = 64K

Level 2 unified cache = ul2 = 128K.

Figure 8 displays the results for a representative case of a large workload.

Figure 8. IPC for Various Combinations of Level1-Level2 Caches for LARGE Workload

This graph gives a slightly different result by giving a saturation point of level 1 caches at 128K and that of level 2 at 256K. Considering all the three graphs together, we can conclude that large workload offers a peak response at 128:256, however the reading for 64:128 combination is very close.

With these results, finally we select a combination as **64K : 128K for level 1 : level 2 cache.** Table 5 shows that the different components in IL1, DL1, UL2 differs slightly from the default values assumed by SimpleScalar.

Table 5. Two level cache organization for optimum performance

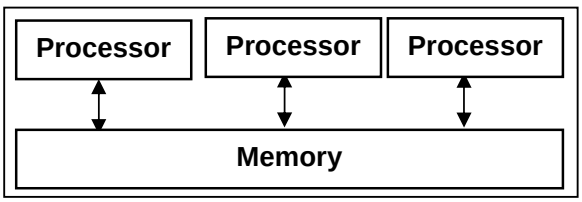
Cache Type	**Parameter**	**Value**
IL1	No. of sets	1024
	Block size	32
	Associativity	02
	Replacement Policy	LRU / FIFO
DL1	No. of sets	1024
	Block size	32
	Associativity	02
	Replacement Policy	LRU / FIFO
UL2	No. of sets	2048
	Block size	32
	Associativity	02
	Replacement Policy	LRU / FIFO

Research carried out for organizing cache has put forth the optimum organization, which gives the best possible performance on any type or size of load (from KB to GB), also for any application. This cache organization proves to be very important for uniprocessor applications. With this base, let us turn our attention to cache organization in multiprocessor architectures, where, the best performance cache design of each processor unit is ascertained. In multiprocessor architectures, data transfers are required several times between different processor units. Additionally, data writing will be done several times by different processors. It is possible that caches of different processors store the same blocks. In such case, data writing in one of the caches will make the data in other caches inconsistent. Special means are used to preserve the data consistency in caches. Study of one representative protocol is discussed in the remaining paper.

5. Introduction To Multiprocessor Architectures

The multiprocessor architectures are denoted as Distributed or Parallel architectures. Distributed computing refers to the use of distributed systems to solve computational problems. In distributed computing, a problem is divided into many tasks, each of which is solved by separate computer. Parallel computing is a form of computation in which many calculations are carried out simultaneously; both the terms are used interchangeably. The architecture may have centralized shared memory or distributed shared memory.. Significant reduction with the problem of memory bandwidth can be resolved by inclusion of large caches with processors. But inclusion of caches with processors creates the problem of cache coherence. The remaining paper presents cache coherence problem and protocol based solution on it mainly for distributed shared memory architecture[3].

5.1 Centralized Shared Memory Architecture



The architecture is shown in Figure 9. It is type of parallel system in which each processor has a direct access to a shared memory. All memory locations have unique addresses.

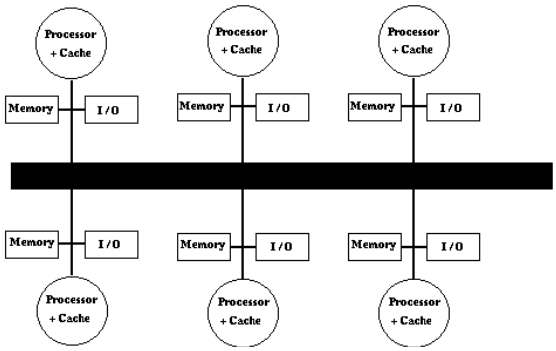
Figure 9 Centralized Shared Memory Architecture

5.2 Distributed Memory Architecture

In this architecture, memory is logically divided in to modules. All modules have same addresses. Inter Processor Communication takes place through messages.

5.3 Distributed Shared Memory Architecture

Advantages of both distributed memory and shared memory can be merged and limitations of both can be overcome in Distributed shared memory (Figure 10) with advantages listed below.



- Logically shared memory
- Physically distributed local memories
- Page based
- Shared pages
- Demand paging between nodes.

Figure 10. Distributed Shared Memory Architecture

The distributed shared memory architecture is most practically used architecture.

5.3. Cache Coherence

In computing, cache coherence (also cache coherency) refers to the consistency of data stored in local caches of a shared resource. When clients in a system maintain caches of a common memory resource, problems may arise with inconsistent data[8].

This is particularly true of CPUs in a multiprocessing system. Cache coherence is intended to manage such conflicts and maintain consistency between cache and memory.

Two policies are used to overcome the cache coherence problem

1. Write Back or Write Invalidate 2. Write through or Write Broadcast

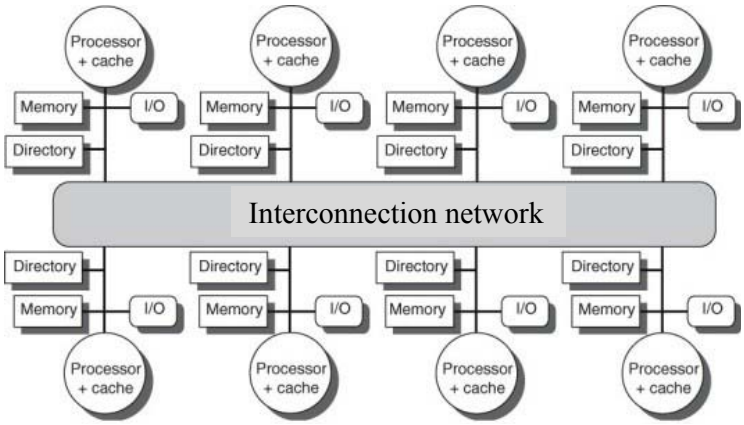
Write Invalidate vs. Write Update Strategies

1. *Write Invalidate:* On a write, all other caches with a copy are invalidated
2. *Write Update:* On a write, all other caches with a copy are updated

Overall, write invalidate scheme is more popular as the default because it occupies less memory bandwidth, so interconnection efficiency increases. In this article, stress is given on distributed shared memory, so a protocol 'Directory based protocol' is discussed.

6. DIRECTORY BASED PROTOCOL

The sharing status of a block of physical memory is kept in just one location, called the directory[4]. This protocol considers the system as shown in Figure 11. A directory is added to each node to implement cache coherence in a distributed memory multiprocessors. Each directory is responsible for tracking the caches that share the memory addresses of the portion of memory in the node. The directory may communicate with the processor and memory over ICN, as shown in Figure 11. There are two primary operations that a directory protocol must



implement: handling a read miss and handling a write to a shared clean cache block. To implement these operations directory must track the state of each cache block. In a simple protocol, these states could be the following:

Figure 11 Distributed shared memory multiprocessor architecture with directories

Shared – One or more processors have the block cached, and the value in memory is up to date.

Uncached – No processor has a copy of respective memory block in cache.

Exclusive – Exactly one processor has a copy of modified cache block, (it has written the block), so the memory copy is invalid. The processor is called the owner of the block.

With these states of cache block, we must track the processors that have copies of the block when it is shared, since they will need to be invalidated on write. The simplest way to do this is to keep bit vector for each memory block as shown below. When the block is shared, each bit of the vector indicates whether the corresponding processor has a copy of that block as shown in Table 6. We can also use the bit vector to keep track of the owner of the block when the block is in the exclusive state as shown in Table 6.

C – Block is cached
S – Block is Shared
E – Block is Exclusive

Table 6 Example of bit vector

Processors		**P1**		**P2**		**Pn**	
Blocks	Status in Memory	C/U	S/E	C/U	S/E	C/U	S/E
B1	Valid	C	S	C	S	U	
B2	Valid	C	S	U		U	
Bn	Valid	C	Invalid	C	E	U	

In this protocol, the communication between processors and directories can happen by sending the messages. Different messages are listed in Table 7 which are sent among nodes. The nodes are categorized as

Local node: It is the node where requests originates.

Home node: It is the node where the memory location and directory entry of an address reside.

Remote node: Copies exist at third node, called remote node.

A remote node is the node that has a copy of a cache block, whether exclusive or shared.

Table 7 Possible messages sent among nodes to maintain coherence

Message Type	**Source**	**Destination**	**Function of this message**
Read miss	Local Cache	Home directory	Processor P has a read miss at address A; request data and make P a read sharer.
Write miss	Local Cache	Home directory	Processor P has a read miss at address A; request data and make P the exclusive owner.
Invalidate	Home directory	Remote Cache	Invalidate a shared copy of data at address A.
Fetch	Home directory	Remote Cache	Fetch the block at address A and send it to its home directory ; change the state of A in the remote cache to shared
Fetch/ Invalidate	Home directory	Remote Cache	Fetch the block at address A and send it to its home directory ; invalidate the block in the cache.
Data Value Reply	Home directory	Local Cache	Return a data value from the home memory
Data Write Back	Remote Cache	Home Directory	Write back a data value for address A.

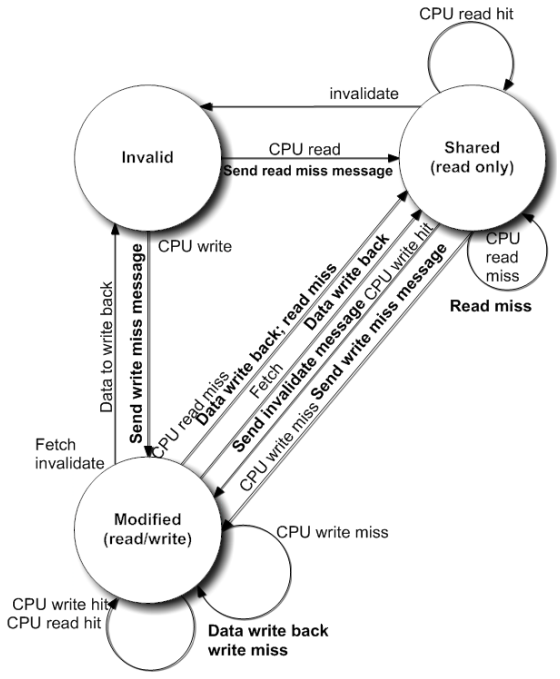


Figure 12 Cache – coherence state transition diagram

A remote node may be the same as either the local node or the home node. In such cases, the basic protocol does not change, but interprocessor messages may be replaced with intraprocessor messages. The possible messages sent among nodes to maintain coherence, along with the source and destination node, the contents (where P = requesting processor number, A = requested address, and D = data contents), and the function of the message[8] are listed in Table 6. State transition diagram for an individual cache block in a directory – based system is shown in Figure 12. In the state diagram, requests by the local processor and from the home directory are shown.

In this protocol the directory implements the other half of the coherence protocol. A message sent to a directory causes two different types of actions: updates of the directory state and sending additional messages to satisfy the request.

The states in the directory represent the three standard states for a block as uncached, shared , exclusive. The Figure 12 shows the actions taken at the directory in response to message received. The directory receives three different requests: read miss, write miss, and data write back. The state transition diagram for the directory has the same states and structure as the transition diagram for an individual cache.

7.0 Conclusions

In this article, memory organization is considered in two parts. 1. Uniprocessor and 2. Multiprocessor.

First part discusses uniprocessor organization. The optimum organization is designed based on the research carried out on superscalar architecture simulated with the help of a tool: SimpleScalar-2.0.

Significance of uniprocessor organization

Memory latency is one of the major problems in achieving overall speed of superscalar architecture. As mentioned earlier, processor speeds are increasing by 60 % per year, and that of the memory are increasing only at the rate of 10 % per year. This makes researchers to try measures to reduce this speed gap. Though memory performance is not directly related to processor performance, it must be taken in to account for overall performance of the system.

The significance of uniprocessor organization lies in helping the multiprocessor architecture to enhance overall performance of the system.

Significance of multiprocessor organization

Part two discusses cache coherence problem and a resolution protocol on it for distributed shared memory architecture. Computers are used in solving every complex problem now days. Multiprocessor architectures are widely used to give solutions on complex problems. Sharing of data in caches and memory is often required in carrying out the solution. Main problem in this is cache coherence. A discussion on the protocol is hence very significant.

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SYNTHESIS AND CHARACTERIZATION OF Fe_3O_4 NANOPARTICLES

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Abstract

Nanocrystalline Fe_3O_4 particles of controlled size were synthesized by chemical co-precipitation method. The material is characterized by various characterization techniques such as X-ray diffraction, transmission electron microscopy (TEM), electron paramagnetic resonance (EPR) and dc magnetization measurements. The X-ray diffraction patterns confirm the synthesis of single crystalline phase of Fe_3O_4 nanoparticles with lattice parameter 8.4090 Å. The particle size is 11.5 nm and increases to 20 nm after annealing. The TEM study also confirms the nanocrystalline nature of the sample. The magnetic measurements show superparamagnetic nature of the sample which is also supported by EPR measurements. The saturation magnetization is 42 emu/g.

Key words Fe_3O_4 nanoparticles, chemical co-precipitation, structural characterization, magnetic properties

Introduction

Ferrite particles with sizes of the order of few nanometers are emerging as promising materials for a variety of applications that span both fundamental and applied research. At the nanometric scale, the size reduction leads to interesting magnetic properties, such as superparamagnetism, enhanced anisotropy and spin canting, which are of great interest in number of applications[1-4]. Among the nanocrystalline ferrites, Fe_3O_4 has attracted particular interest as an ideal candidate for different biomedical applications such as cell separation, magnetic resonance imaging, enzyme encapsulation, tumor hyperthermia and targeted drug delivery[3, 4]. As the material properties are size dependent, it is a technological challenge to control the size and shape of the nanoparticles. At present a variety of methods has been developed for the synthesis of ferrite nanoparticles. These include sol-gel, hydrothermal, chemical co-precipitation, sonochemical reactions and ball milling[5-9]. However, chemical co-precipitation method is relatively simple and provides good control over particle properties. The method offers a low-temperature alternative to conventional powder synthesis techniques in the production of nanoparticles[7, 10]. Furthermore, if process conditions such as solution pH, reaction temperature, stirring rate, solute concentration and surfactant concentration are carefully controlled, oxide particles of the desired shapes and sizes can be produced. This paper presents synthesis of Fe_3O_4 nanoparticles by chemical co-precipitation method and reports some of its properties.

Experimental

Fe_3O_4 nanoparticles were prepared by the chemical co-precipitation method[10]. AR grade $FeCl_2$ and $FeCl_3$ were used as starting materials. For synthesis, equimolar solutions of $FeCl_2$ and $FeCl_3$ were mixed in their stoichiometric ratio and homogenized at room temperature. The pH of the solution was adjusted by adding ammonia solution. The mixture was then heated at 80 ^oC for about one hour. Oleic acid was used as surfactant to prevent agglomeration of particles. The precipitate was then washed several times with double distilled water to remove the salt residues and other impurities. The samples were annealed at 300^oC for one hour. The samples were then characterized by various characterization techniques.

The X-ray diffraction patterns (XRD) were recorded using a Rigaku powder X-ray diffractometer with Cu K_α (λ=1.54059 Å) radiation. The scanning was done in the 2θ range from 20° to 70° at a scanning speed of 0.02°/s. The TEM was recorded on transmission electron microscope (Model-JEOL JEM-200 CXV). The magnetization measurements were carried out on these samples by a search coil method. A polytronic power supply (Model-BCS-1000), electromagnet (Type Hem-100) and flux meter (Model FM109) were used for this purpose. The setup was calibrated using standard nickel sample. The EPR measurements were carried out by using a Varian E Line Century X-band EPR spectrometer (Model-E-112). The measurements were done at 9.36 GHz with modulation frequency 100 kHz.

Results and Discussion

The structural analysis of samples was done by powder X-ray diffraction technique using Cu K_α radiation. Figure 1 shows the powder X-ray diffraction patterns for as-synthesized and annealed (300^oC) samples. The 'd' values and intensities of the observed diffraction peaks match with the single crystalline spinel form of Fe_3O_4 nanoparticles (JCPDS Card No. 019-0629). X-ray diffraction pattern shows broad peaks indicating ultrafine nature and small crystallite size of the particles. On annealing there is improvement in sharpness of the peaks, however, no change in peak positions is observed. The lattice parameters were calculated for these samples. It is observed that lattice parameter is 8.4090 Å. The observed lattice parameter is slightly higher than the standard value indicating that samples are under strain. The induced strain in the crystallites is 0.00155. The crystallite size of as-synthesized and annealed samples was then determined by using the Scherrer relation:

$$D = 0.89 \lambda / \beta \cos \theta \qquad \text{--- (1)}$$

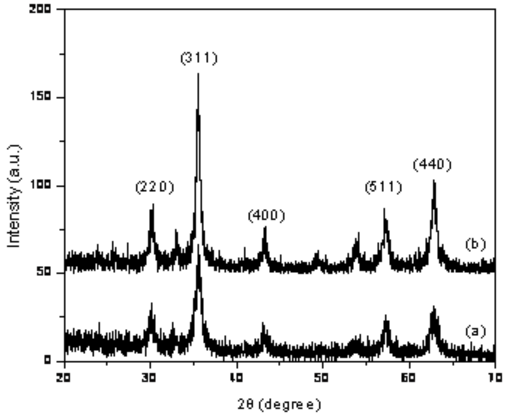

Figure 1: X-ray diffractograms of: (a) as-synthesized and (b) annealed Fe_3O_4 samples.

where, D is the crystallite size, λ is wavelength of X-ray, β is full width at half maximum (FWHM) measured in radians and θ is the Bragg angle. For as-synthesized sample the average crystallite size is 11.5 nm and increases to 20 nm after annealing. The increase in the crystallite size after annealing indicates the grain growth of the particles at the temperature well below the melting temperature of the bulk ferrites.

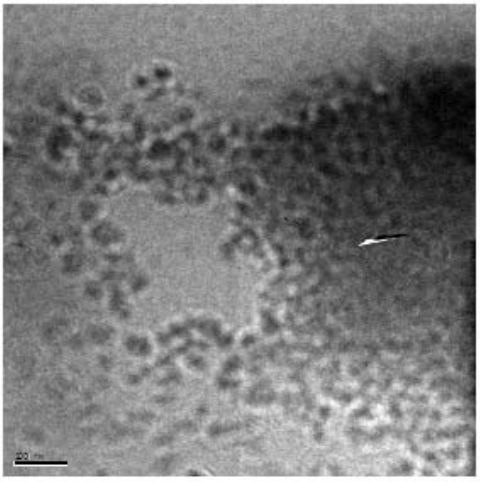

Figure 2: TEM image of as-synthesized Fe_3O_4 sample.

The transmission electron microscopy was used to study the morphology and structure of the sample. Figure 2 shows a TEM image of as-synthesized Fe_3O_4 sample. The sample contains well dispersed nanoparticles with average particle size of the order of 10-20 nm. The TEM study supports the XRD observations.

Magnetic measurement was carried out at room temperature and Figure 3 displays the magnetization curve for this sample. The magnetization curve demonstrates a typical superparamagnetic behavior of the as-synthesized sample. The superparamagnetism of these nanoparticles can be attributed to their finite crystallite size, which makes it easier for them to be thermally activated to overcome the magnetic anisotropy[3]. It is seen that saturation magnetism is 42 emu/g. The smaller value of saturation magnetization is due to lattice defects, weaker magnetic superexchange interactions between A-sites and B-sites, and random orientation of spin on the surface of the nanoparticles[11, 12].

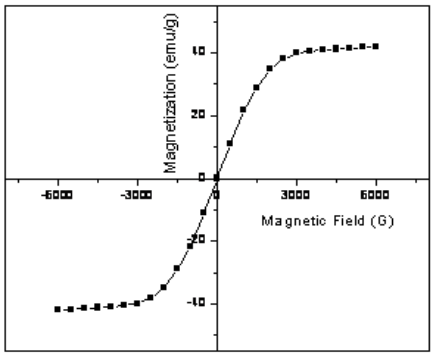

Figure 3: Magnetization curve of as-synthesized Fe_3O_4 nanoparticles

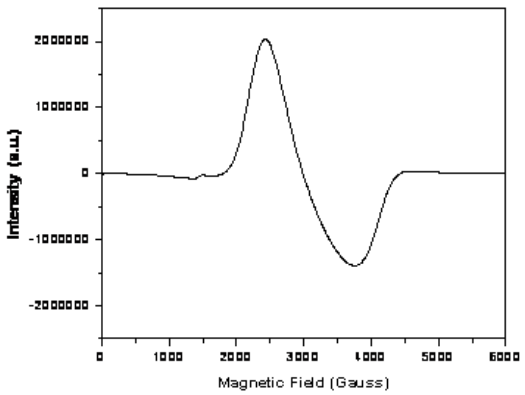

Figure 4: EPR spectra of as-synthesized Fe_3O_4 nanoparticles

Electron paramagnetic resonance (EPR) is a very powerful sophisticated technique for the characterization of magnetic particles and spin dynamics in solids. Figure 4 shows the EPR spectra of Fe_3O_4 nanoparticles recorded at ambient temperature, which demonstrates the typical superparamagnetic nature of the sample. The spectrum was analyzed to obtain the values of magnetic field at resonance (H_o), resonance line width (ΔH_{pp}) and the effective g-value. The values of magnetic field at resonance (H_o) and resonance line width (ΔH_{pp}) are 2966 G and 1333 G, respectively. The effective g-value is determined from the following equation[1]:

$$g = h\upsilon / \beta H \qquad \text{--- (2)}$$

where, h is Plank's constant, υ is the microwave frequency, β is Bohr magneton and H is the magnetic field at resonance. The value of g is found to be 2.2662.

Conclusion

A low temperature chemical co-precipitation method can be used for synthesis of nanocrystalline Fe_3O_4 particles. The X-ray diffraction pattern confirms the synthesis of single crystalline phase of Fe_3O_4 nanoparticles with lattice parameter 8.4090 Å. The particle size is 11.5 nm and increases to 20 nm after annealing. The TEM study also confirms the nanocrystalline nature of the sample. The magnetic measurements show superparamagnetic nature of the sample which is also supported by EPR measurements. The saturation magnetization is 42 emu/g. The properties of Fe_3O_4 nanoparticles are suitable for ferrofluid application.

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SYNTHESIS AND CHARACTERIZATION OF SCHIFF BASES DERIVED FROM AMINOTHIAZOLE

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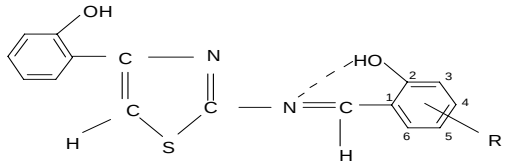
Abstract

A series of heterocyclic Schiff bases (SB-1 to SB-8) have been synthesized, by reacting 4-(o-hydroxyphenyl)-2-aminothiazole and R-substituted salicylaldehyde (R= H, 3-Me, 4-Me, 5-Me, 5-Br, 5-Cl, 3-OMe) and 2-hydroxy-1-naphthaldehyde. They were characterized by elemental, spectral, thermal and XRD analyses and evaluation of biological activities. From the TGA-DTA curve, various kinetic parameters (n, E, Z, ΔS and G) were estimated using Horowitz-Metzger method. XRD studies suggested a triclinic crystal system. The Schiff bases were found to be biologically active compounds.
Key words- Heterocyclic Schiff bases, thiazole Schiff bases

Introduction

Schiff bases belong to an important class of organic compounds and they undergo a variety of reactions (addition, cycloaddition, substitution and cleavage of C=N bond).[1] Schiff bases derived from o-hydroxyaldehydes have strong ability to form metal complexes[2]. Thiazoles are well known as biologically active substances and they exhibit a wide spectrum of antitubercular[3], antibacterial[4], antifungal[5], hypotensic and hypodermic[6] activities. Hence the Schiff bases derived from thiazoles are expected to be biologically active compounds. In our earlier communication, we have reported spectral, thermal, XRD and biological studies on 4-(p-fluorophenyl)-2-aminothiazole.[7]

In the present communication, we report synthesis and characterization of heterocyclic Schiff bases (SB-1 to SB-8) (Figure 1) obtained by reacting 4-(o-hydroxyphenyl)-2-aminothiazole and R-substituted salicylaldehyde (R= H, 3-Me, 4-Me, 5-Me, 5-Br, 5-Cl, 3-OMe) and 2-hydroxy-1-naphthaldehyde. They have been characterized by elemental, spectral, thermal and X-ray diffraction analyses and evaluation of antibacterial and antifungal activities.



SB 1:R(H), SB 2: R(3-Me), SB 3:R(4-Me), SB 4:R(5-Me),
SB 5:R(5-Br), SB 6:R(5-Cl), SB 7:R(3-OMe), SB 8:R ()
Figure 1. Heterocyclic Schiff bases synthesized

Experimental

All the chemicals used were of A.R. grade. The solvents were dried according to standard procedures and distilled before use. The elemental analyses (C, H and N) were performed using microanalytical technique. Ultraviolet and visible spectra were recorded in chloroform solution on Shimadzu 160A uv-visible spectrophotometer using quartz cells at room temperature. Infrared spectra were recorded in KBr pellets on Perkin-Elmer 783 IR spectrophotometer in the range 4000-250 cm^{-1}. ^1H NMR spectra were recorded in $CDCl_3$ on Varian 300 MHz spectrometer using TMS as the internal standard. Mass spectrum was recorded on Shimadzu GC MS QP 5050. Thermograms were recorded on V2 4F TA thermal analyser at the heating rate 10^0 C per minute in nitrogen atmosphere. X-ray diffractograms were run in the range 10-90^0 using a Philips PW-1710 diffractometer attached to a digitized computer along with graphical assembly where CuKα radiation source connected with a tube of Cu-NF 2kV/20mA was used.

Synthesis of 4-(o-hydroxyphenyl)-2- aminothiazole

A mixture of o-hydroxyacetophenone (0.05 mol), iodine (0.1 mol) and thiourea (0.05 mol) was refluxed on water bath for eight hours and again 12 to 16 hours after removal of the condenser. The crude reaction product was kept in contact with ether with occasional shaking for 48 hours. The ether layer was then removed and reaction product was treated with sodium thiosulphate solution to remove traces of iodine. The product was then boiled with water and filtered hot. The filtrate was treated with concentrated ammonia to obtain 4-(o-hydroxyphenyl)-2- aminothiazole, which was recrystallised from 50% ethanol and dried under reduced pressure (melting point 139 ^{0}C).

Synthesis of Schiff bases

The Schiff bases SB-1 to SB-8 were prepared by refluxing equimolar amounts of 4-(o-hydroxyphenyl)-2-aminothiazole and o-hydroxyaldehyde in ethanol for 30 minutes. The crystals separated on cooling the solution were filtered under suction, recrystallised from ethanol and dried under reduced pressure. The purity of the compounds was tested by TLC.

Results and discussion

Aminothiazole

4-(o-hydroxyphenyl)-2-aminothiazole is a colorless crystalline compound having melting point 139^0C. It is soluble in common organic solvents. Results of C, H and N analyses matched with calculated values.

The uv-visible spectrum of the compound exhibits λmax at ~ 300 nm which is in accordance with the λmax exhibited by 2-aminothiazole (~ 275 nm) and other aromatic compounds with comparable structures (~ 300 nm) [8].The IR spectrum of the compound exhibits ν(NH_2), ν(C=N) and ν(C-S-C) modes[9] at ~3340, ~1620 and ~550 cm^{-1} respectively. ν(OH) mode[9] occurs at ~3460 cm^{-1}. The ^1H NMR spectrum of the compound shows the signals at δ ppm 11.523 (s, 1H, -OH), 5.01 (s, 2H, NH_2), 6.8-6.9(5H, m,Ar-H and thiazole-H). The assignment of the signals is in agreement with the earlier reported results.[10]

The mass spectrum of the compound exhibits M^+ peak at m/z ratio 192 (relative intensity 100%) corresponding to the molecular weight of compound and confirms the molecular formula as $C_9H_8ON_2S$. The molecular ion undergoes rupture of thiazole ring[11] to give fragment at m/z 150 (relative intensity 34%). The fragment (m/z 150) further looses OH group to give fragment having m/z 133 (48%) (Fig. 2). The fragments (m/z 133) then undergoes decomposition to give smaller fragments as m/z (relative intensity %): 121(41), 104(33), 90(16), 77(21), 69 (21).The mass spectrum is depicted in Figure 3.

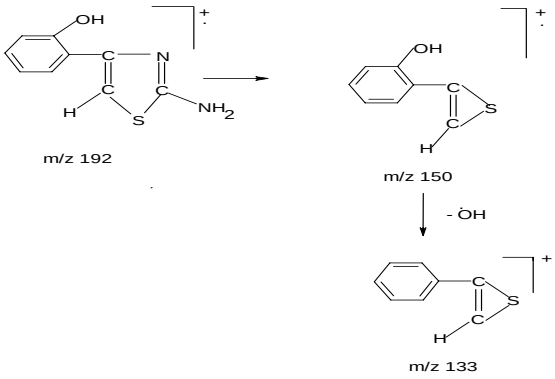


Figure 2. Fragmentation pattern

Schiff bases

All the Schiff bases (SB-1 to SB-8) are yellow crystalline solids having sharp melting points. They are soluble in common organic solvents (alcohols, acetone, $CHCl_3$, DMF, etc.) and gave satisfactory elemental (C, H and N) analyses. The elemental analyses and melting point data is

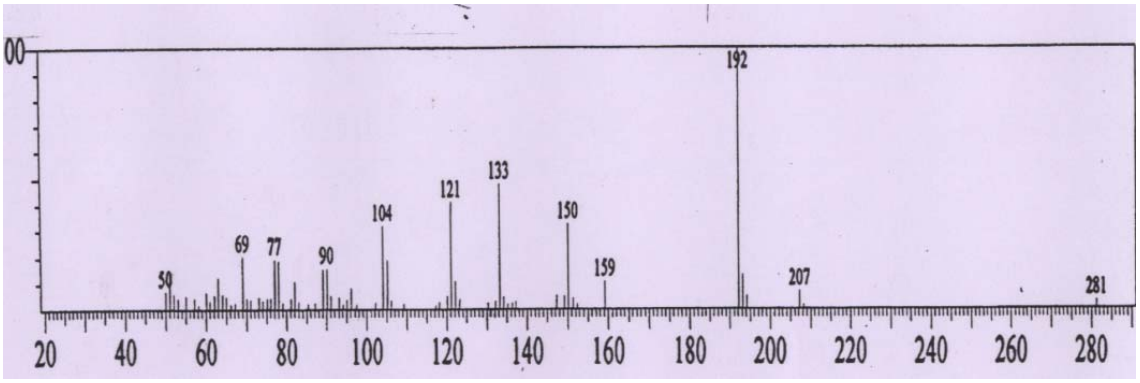


Figure 3. Mass spectrum of 4-(o-hydroxyphenyl)-2-aminothiazole

represented as % found (calc), m.p.^{0}C: **SB-1** C% 64.83 (64.86), H% 3.99 (4.05), N% 9.39 (9.45), 160; **SB-2** C% 65.76 (65.80), H%4.60 (4.51), N%9.10 (9.03),205; **SB-3** C% 65.78 (65.80), H% 4.49 (4.51), N% 9.03 (9.03),191; **SB- 4** C%65.82(65.80), H% 4.48 (4.51), N% 8.95 (9.03), 140; **SB-5** C%51.11 (51.21), H% 2.89 (2.93), N% 7.45 (7.46),101; **SB-6** C%57.99 (58.09), H% 3.28 (3.32), N% 8.45 (8.47),105; **SB-7** C%62.52 (62.57), H% 4.24 (4.29), N% 8.65 (8.58),205; **SB-8** C%69.31 (69.36), H% 4.10 (4.04), N% 7.98 (8.09),215.

UV- visible spectra of the compounds in chloroform exhibit λmax at ~ 400 nm as against λmax at ~ 300 nm exhibited by corresponding thiazole, 4-(o-hydroxyphenyl)-2-aminothiazole. The shifting of λmax (~400 nm) of the reported Schiff bases towards longer wavelength may be due to extended conjugation in the molecule.

IR spectra of the Schiff bases exhibit $\nu_{C=N}$, ν_{C-O} , ν_{C-S-C} modes at ~1630 and ~ 1280 and ~665 cm $^{-1}$ respectively[9] .The ν_{OH} mode occurs at ~ 3100 cm^{-1}. Another ν_{OH} mode occurs at ~ 2900 cm^{-1} (a broad and weak band due to the intramolecular hydrogen bonding between phenolic OH and nitrogen of the azomethine group) [9] .

^{1}H NMR data of the Schiff bases is represented below. The assignment of NMR signals is in agreement with literature values[10]. NMR signals (δ ppm) : **SB-1**: 11.24 (1H, s, thiazoleamine–OH) 6.9-7.6 (9H, m, thiazole and Ar H), 9.12(1H, s, benzylidenimin), 11.24(1H, s, thiazoleamine -OH), 12.086(1H, s, aldehyde-OH); **SB-2:** 2.32(3H, s, CH_3), 6.8-7.6(8H, m, thiazole and ArH), 9.1(1H, s, benzylidenimin),11.26(1H, s, thiazoleamine -OH), 12.37(1H, s, aldehyde-OH)**;SB-3**: 2.39(3H, s, CH_3), 6.79-7.6 (8H, m, thiazole and ArH), 9.06(1H, s, benzylidenimin),11.30(1H, s, thiazoleamine -OH)**,** 12.08(1H, s, aldehyde-OH);**SB-4:** 2.32(3H, s, CH_3), 6.8-7.6(8H, m, thiazole and Ar H), 9.048(1H, s, benzylidenimin),11.30(1H, s, thiazoleamine -OH), 11.86(1H, s, aldehyde -OH);**SB-5:** 6.66-7.39(7H, m, thiazole and ArH), 9.25(1H, s, benzylidenimin), 11.62 (1H, s, thiazoleamine -OH), 12.29 (1H, s, aldehyde -OH);**SB-6:** 6.8-7.49(7H, m, thiazole and ArH), 9.05(1H, s, benzylidenimin),11.80 (1H, s, thiazoleamine -OH), 12.03 (1H, s, aldehyde -OH);**SB-7:** 3.97(3H, s,-OCH_3), 6.7-7.6(8H, m, thiazole and ArH), 9.16(1H, s, benzylidenimin),11.25 (1H, s, thiazoleamine -OH), 12.33 (1H, s, aldehyde -OH); **SB-8:** 6.9-8.2(11H, m, thiazole and (ArH), 8.23(1H, s, benzylidenimin), 11.38(1H, s, thiazoleamine -OH), 14.25 (1H, s, aldehyde -OH). As a representative example, ^{1}HNMR spectrum of SB-4 is given in Figure 4.

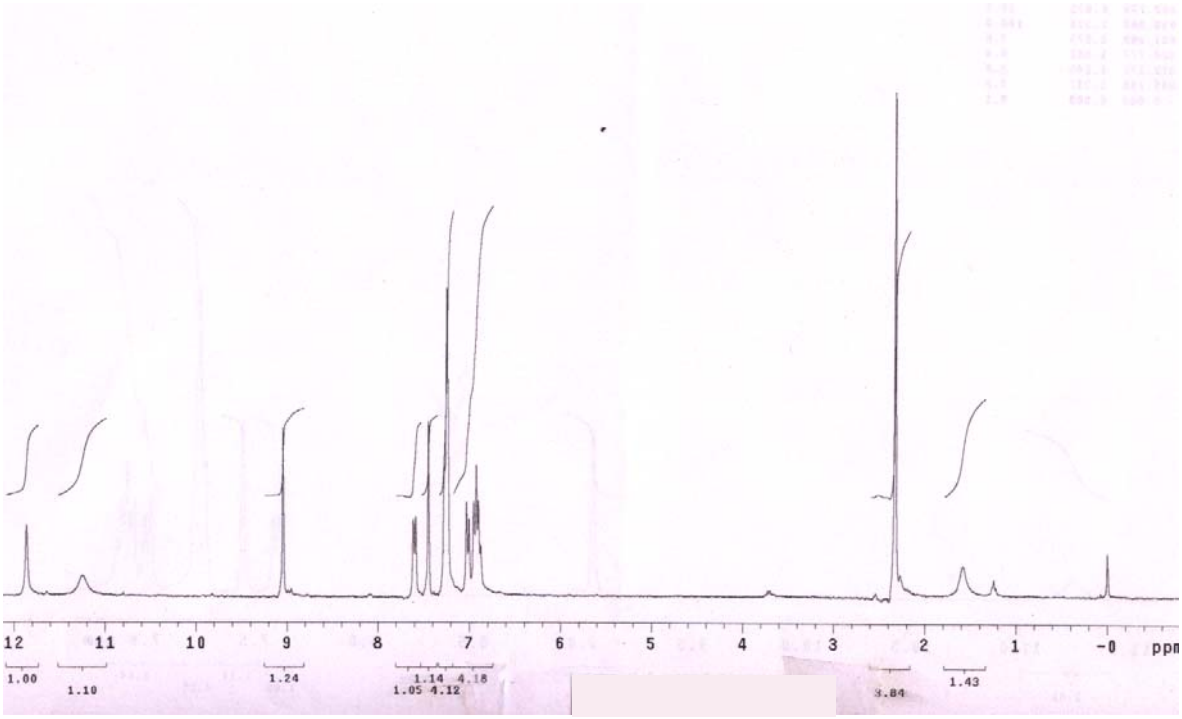


Figure 4. [1]HNMR spectrum of SB-4

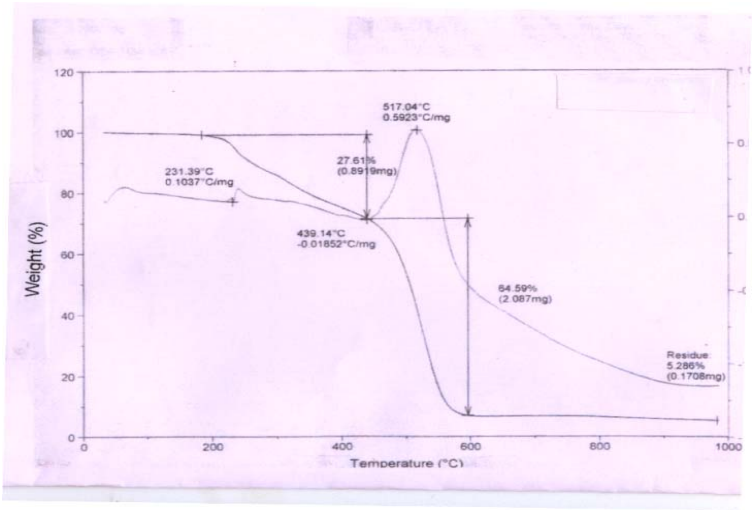
Thermal analysis

The TG curves of the Schiff bases are critically analyzed in order to evaluate various kinetic parameters such as order of reaction (**n**), energy of activation (**E**), pre-exponential factor (**Z**), entropy of activation (**ΔS**) and free energy of activation (**G**) using Horowitz-Metzger method [12] (equation 1).

Horowitz – Metzger Method [12]

$$\log\left[\frac{1-(1-\alpha)^{1-n}}{(1-n)}\right] = \log\frac{ZRT_S^2}{Eq} - \frac{E}{2.303\,RT_s} + \frac{E\,\theta}{2.303\,RT_s^2} \quad \ldots\ldots 1$$

Where α is the fraction decomposed, q the heating rate, T the absolute temperature, T_s the temperature at half weight loss and $\theta = (T-T_s)$.



The Schiff base (SB-4) is chosen for thermal studies. The TG-DTA curve is depicted in Figure 5. The compound undergoes decomposition in two stages: stage I (193.5 – 450.34 ^{0}C), stage II (450.34 – 602.31 ^{0}C). The stage I and stage II show 27.61 % and 64.59 % weight loss respectively. Two DTA peaks (endothermic) are observed at 231.39 ^{0}C and 439.14 ^{0}C. One DTA peak (exothermic) is observed at 517.04 ^{0}C. The values of kinetic parameters (n, E, Z, ΔS and G) calculated by Horowitz- Metzger method are given in Table 1. The values of E for stage I and stage II (25.64 and 57.70 Kcal /mole respectively) are sufficiently high and they suggest that the compound is thermally stable.

Figure 5. TG-DTA curve of SB-4 (Heating rate : 10^{0}C / min)

Table 1. Kinetic Parameters Estimated by Horowitz-Metzger Method

Compound	Kinetic Parameters	Step I	Step II
SB-4	**n**	3.52	1.46
	E	25.64	57.70
	Z	6.22×10^6	7.84×10^{13}
	ΔS	-11.68	-20.43
	G	29.26	21.54
Units: E, kcal mol^{-1}; Z, s^{-1}; ΔS, JK^{-1} mol^{-1}; G, kcal mol^{-1}			

X-ray diffraction studies

A representative Schiff base SB-4 is chosen for the X-ray diffraction studies. Diffractogram is depicted in Figure 6. There are 33 reflections (2θ) between 5.34^0 and 68.685^0 with maximum at $2\theta=5.57^0$ and d = 15.8325 A^0. The cell parameters calculated are given in parenthesis (a = 8.6232 A^0, b = 9.4755A^0, c = 10.3723A^0; $\alpha = 110.741^0$, $\beta = 104.338^0$, $\gamma = 97.230^0$), which are in accordance with

Figure 6 : X- ray diffractogram of SB 4

those required for a triclinic crystal system[13] where $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^0$.

Biological activity

The Schiff bases SB-1 to SB-8 were screened for the evaluation of antibacterial activity against *S. aureus* and *K. pneumoniae* and antifungal activity against *A. niger* and *C. albicans* in DMF in the concentration range 2- 20 μg/ml using serial dilution technique[14]. The MIC values have been reported. The MIC values lie in the range 14-16 μg/ml for antibacterial activity and 12-14 μg/ml for antifungal activity. Hence it is concluded that the Schiff bases exhibit good antibacterial and antifungal activities.

Conclusions

The Schiff bases (SB-1 to SB-8) are crystalline and thermally stable compounds. X-ray diffraction study of a representative compound (SB-4) suggests a triclinic crystal system. All the compounds exhibit good antibacterial activity against *S. aureus* and *K. pneumoniae* and antifungal activity against *A. niger* and *C. albicans*.

Acknowledgement

The authors are thankful to Solapur University, Solapur and Shivaji University, Kolhapur for providing facilities. One of the auther (AMN) is thankful to UGC, New Delhi for the award of a teacher fellowship and to Dr Deshmukh A.M. for useful discussions.

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SYNTHESIS AND BIOLOGICAL EVALUATION OF 2-(1'-PHENYL-3-ARYL-1*H*-PYRAZOL-4-YL)-6-CHLORO FLAVONE

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Abstract

An efficient and convenient method for the synthesis of 2-(1'-Phenyl-3-aryl-1*H*-pyrazol-4-yl)-6-chloro flavone by using the green solvent polyethylene glycol(PEG) 400 is reported here. The structures of the synthesized compounds were confirmed by spectral studies. Antimicrobial (antibacterial and antifungal) activities of the compounds were screened against *Escherichia coli, Salmonella typhi, Staphylococcus aureus, Bacillus subtills, Aspergillus niger, Aspergillus flavus, Fusarium moneliforme and Penicillium chrysogenum.*

Key words Flavones, PEG 400, Antimicrobial activity

Introduction

The flavones are the naturally occuring heterocyclic compounds belonging to the flavonoid group. These are widely distributed in vascular plants[1]. Though their presence being a century old[2], isolation[3] of new flavones and newer methods [4] of synthesis continue appear. Their attraction as synthetic targets is due to the wide range of biological activties like antimicrobial, antiulcer, estrogenic, anti-HIV[5], antiviral[6], antioxidants, DNA cleavage, Antiinflammatory[7], antimutegenic, antiallergic[8], anticancer[9]. Recently there is a surge to employ green solvent in organic synthesis. Green solvent like PEG-400 offers advantages over organic solvent due to rapid reaction and their easy removal. So we have used alternative reaction solvent[10] PEG-400 for the synthesis of flavones. Easy cyclisation of 2'-hydroxy chalcones was observed in presence iodine in PEG-400 within 2 hours at mild temperature.

Chemistry and Experimental

In the present investigation the chalcone ie. 1-(5-chloro-2-hydroxyphenyl)-3(3-(4 – hydroxyphenyl)-1-phenyl-1H-pyrazol-4-yl)-2-propen-1-one (1) has been prepared by using Claisen-Schmidt condensation of substituted 2-hydroxy acetophenone and substituted 1-phenyl-3-aryl-1H-pyrazole-4-carboxaldehyde by known literature method [11 ,12.] The desired 2-(1-phenyl-3-aryl-1-H-pyrazol-4-yl)-6-chloro flavones were prepared by oxidative cyclisation of (1) in PEG-400 and I_2 . The product obtained was crystallised from ethanol.

The starting materials (chalcones) were synthesized. PEG-400 and iodine crystals were commercially obtained (SD Fine Chemicals, Mumbai). The purity of the synthesized flavones was checked by TLC on microscopic slide with silica gel-G layers. The spots were exposed in iodine chamber. The melting points were determined in open-glass capillaries.

The structures of flavones were confirmed by spectral analysis (IR, ^{1}H NMR and MS). IR spectra of compounds were scanned on FTIR Perkin Elmer Model RXI spectrometer. ^{1}H NMR spectra were recorded in DMSO-d_6 and $CDCl_3$ on Avance-300 MHz spectrometer by (DOP-13A) operating procedure using TMS as an internal standard (chemical shift are given in δ ppm). The mass spectra (MS) were recorded on EIMS 40-600 Da mass spectrometer and GCMS solution system.

Synthesis of 2-(1'-phenyl-3-aryl-1H-pyrazol-4-yl)-6-chloro flavone (2a) :

To a solution of 1-(5-chloro-2-hydroxyphenyl)-3[-3-(4^1-hydroxyphenyl)-1-phenyl-1*H*-pyrazol-4-yl]-2-propen-1-one (0.417 g ; 1mmol) in PEG-400 (15 ml), added catalytic amount of iodine(10 mg) and heated under mild condition for 2 hours. After completion of the reaction (TLC), the reaction mixture was cooled to room temperature and poured in ice cold water (100 ml) . The separated product was filtered and washed with dilute sodium thiosulphate solution (10%), followed by ice cold water. The isolated product after recrystallization from ethanol gave the flavone **2a**. (Figure 1)

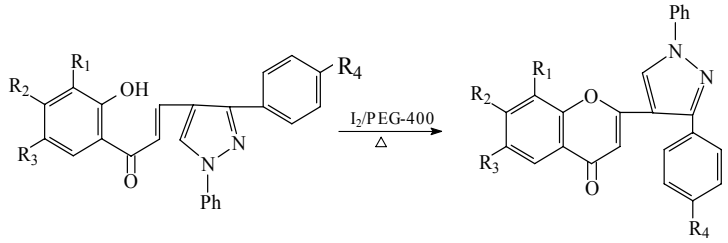

Figure 1. Synthesis of flavones (2a-2l)

This typical experimental procedure was followed to prepare other analogs of this series as shown in Table 1

Spectral data of some selected compounds

Compound (2h): *IR (KBr, cm^{-1})*: 3068.5, 1654.8, 1596.9, 1542.9, 1396.4, 1228.6, 1064.6, 759.9 *cm^{-1}*.

^{1}H NMR (DMSO-d_6): δ 6.60 (s, 1H, 3-H of Pyrone), 7.20-8.80 (m, 11H, Ar-H), 9.20 (s, 1H, H-5 of Pyrazole).

Table 1. Flavone analogues prepared

Sr. No.	Product	SUBSTITUENTS				Yield (%)	MP (^{0}C)
		R_1	R_2	R_3	R_4		
1	2a	H	H	Cl	OH	85	255
2	2b	Br	H	Cl	OH	85	260
3	2c	I	H	Cl	OH	90	280
4	2d	I	H	CH_3	OH	85	265
5	2e	I	CH_3	H	OH	85	275
6	2f	H	H	Cl	Cl	95	280
7	2g	Br	H	Cl	Cl	90	222
8	2h	I	H	Cl	Cl	85	196
9	2i	H	OH	H	Cl	90	260
10	2j	H	CH_3	Cl	Cl	90	270
11	2k	Cl	OH	Cl	Cl	95	272
12	2l	I	CH_3	Cl	Cl	95	260

Compound (2f): *IR (KBr, cm^{-1}):* 3060.8, 1654.8, 1604.7, 1568, 1533.3, 1095.5, 752.2 cm^{-1}.

^{1}H NMR (DMSO- d_6): δ 6.65 (s, 1H, 3-Hofpyrone), 7.00-8.30 (m, 12H, Ar-H), 9.20 (s, 1H,H-5 of

pyrazole)

MS-m/z: 434 (M^+).

Compound (2j): *IR (KBr, cm^{-1}):* 3070.5, 1664.5, 1635.5, 1598.9, 1508.2, 1450.4, 1305.7, 1267.1, 1213.1, 756 cm^{-1}.

^{1}H NMR (DMSO-d^6): δ 2.40(s, 3H, Ar-CH_3), 6.55 (s, 1H, 3-H, of pyrone), 7.20-8.10 (m, 11H, ArH), 9.35 (s, 1H, H-5 of Pyrazole); *MS (ESI) m/z:* 446 (M^+).

Results and Discussion

Newly synthesized compounds were screened against four bacterial and four fungal pathogens of plants and human. The bacteria tested were .*Escherishia coli (E.coli), Salmonella typhi (St), Staphylococcus aureus (Sa) and Bacillius subtilis (Bs)*. It is clear from the results presented in Table 2 those Flavones 2a to 2l are moderately active compounds against *Staphylococcus aureus, Bacillus megaterium* and *Serratia marcescens* bacteria but

compounds 2c and 2j possess good activity against Bacillus megaterium as shown in Figure 2. Some of the newly synthesized compounds were also assessed for their antifungal activities against selected fungal plant pathogens like *Aspergillus niger (An), Aspergillus flavus (Af), Penicillium chrysogenum (Pc) Fusarium moneliforme (Fm).*

The results presented in Table 2, it is clear that all the flavones (2a to 2l) showed good antifungal activity than the used standard drug like Nystatin. Especially these synthesized flavones are more antifungal against *Trichoderma viridae, Penicillium chrysogenium, fusarium moniliforme, Microsporum cannis and candida albicans fungi.*

Table 2. Antimicrobial activities of Flavones (Zone of inhibition in mm)

Entry	Bacteria								Growth of Fungi						
	Ec	*St*	*Pv*	*Sa*	*Pa*	*Bs*	*Bm*	*Sm*	*An*	*Tv*	*Af*	*Pc*	*Fm*	*Mc*	*Ca*
2a	±	-	±	15	±	15	10	12	++	25	++	11	15	±	15
2b	±	-	±	10	±	-	11	10	++	27	++	10	25	15	13
2c	±	-	±	12	±	-	20	±	++	23	++	11	15	10	-
2d	12	-	±	15	±	-	15	15	++	20	++	13	-	16	20
2e	±	-	±	11	±	15	10	±	++	22	++	10	-	10	-
2f	±	-	-	±	±	15	±	-	++	16	++	15	10	-	±
2g	±	-	±	10	±	-	11	12	++	25	++	±	10	++	±
2h	±	-	±	15	±	11	10	10	++	20	++	15	15	++	++
2i	±	-	±	10	±	-	11	±	++	18	++	12	10	15	++
2j	±	-	±	12	±	-	20	15	++	20	++	10	12	16	++
2k	±	-	±	15	±	-	15	±	++	18	++	±	10	12	++
2l	±	-	±	11	±	12	10	16	++	18	++	++	++	10	++
Control (DMSO)	-	-	-	-	-	-	-	-	-	+-	++	±	±	±	±
Penicillin	-	NA	NA	NA	24	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetra-Cyclin	-	32	25	33	34	27	29	20	NA	NA	NA	NA	NA	NA	NA
Nystatin	NA	NA	NA	NA	NA	NA	NA	NA	14	18	14	17	10	10	

Ec = Escherichia coli,
St= Salmonella typhi,
Pv= Proteus vulgaris,
Sa = Staphylococcus aureus,
Pa = Pseudomonas aeniginosa,
Bs = Bacillus subtilis
Bm = Bacillus megaterium

An= Aspergillus niger,
Tv= Trichodenma viridae
Af = Aspergillus flavus
Pc = Penicillium chrysogenium,
fm= Fusarium moniliforme
Mc =Microsporum cannis
Ca=Candida albicans

Sm = Serratia marcescens,
NA= Not applicable

++ = more spore area affected
± = Trace activity
- = No detected

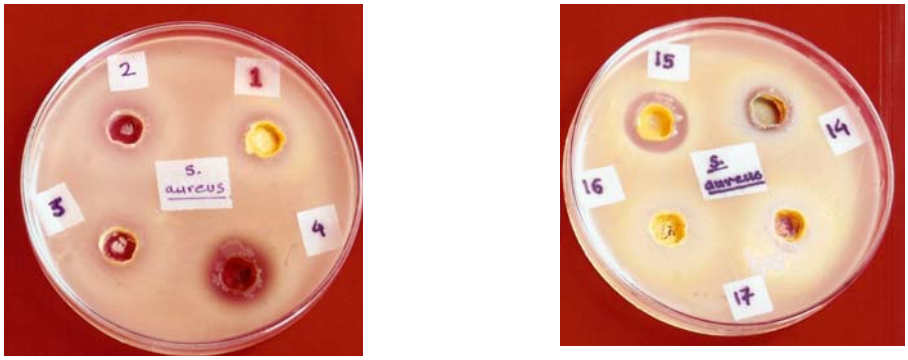

Figure 2. In vitro Antibacterial activity of Flavones

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BIOTRANSFORMATION OF TEXTILE AZO DYE REACTIVE ORANGE 16 BY AEROBIC BACTERIA

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Abstract

Release of azo dye in the environment is of great concern due to colour, toxicity, mutagenicity and recalcitrant nature of the dye and hence considerable attention has been given in determining the ability of microorganism in decolorization and degradation of the azo dyes. Acclimatized microorganisms isolated from natural sources were used for the study of decolorization and degradation of the dye Reactive Orange 16. In all 12 promising isolates were isolated which could decolorize 1000 µg/ml of dye to more than 70 % in nutrient medium and up to 68 % in half strength nutrient medium. The cell free extract showed decolorization up to 67% in less than 24 hours. Percent decolorization of the dye was determined spectrophotometrically by measuring absorption at (λmax) 492 nm. Six isolates reduced the COD by more than 85 %.

Keywords Degradation, Decolorization, Textile Dyes, COD reduction, Aerobic Bacteria.

Introduction

Water is undoubtfully the most precious and divine natural resource which exists on our planet. Life without water is beyond imagination, in other words, we can say, life wouldn't exist without water. On our planet life and nature are very closely related with each other, so we should be cautious in protecting the environment to lead a happy and contented life. But the rapid industrialization and population explosion has made the environmental problem more and more severe. To attain the increased demand of the textile products, this industry and its effluents have been increasing exponentially, making it one of the severe pollution problem worldwide[1].

Dyes used in the dyeing process of the textile industry pose a great threat to the life and environment. More than $7x\ 10^5$ tons of these dyes are annually produced worldwide[2]. Synthetic azo dyes are extensively used in textile, food and cosmetics industries[3] due to their ease of production, colour fastness and variety in colour compared to natural dyes[4]. These azo dyes are designed to remain stable and long lasting colorants and hence they are not easily biodegraded. Azo dyes are regarded as pollutants as they are frequently found chemically unchanged even after waste water treatment[5,6]. The treatment system of coloured wastewater, based on physical and chemical procedures, is effective but suffers from shortcomings such as high cost, formation of toxic residues and intensive energy requirement. If not treated these dyes are stable and can remain in environment for extended period of time, for instance, at pH 7.0 and at 25^0C the half life of hydrolyzed Reactive Blue 19 is about 46 years[1].

Microbial decolorization and degradation is an environment friendly and cost competitive substitute to different conventional treatment technologies[7,8]. To develop biological waste treatment of azo dyes, it is necessary to isolate the microorganisms from the natural environments which can decolorize and degrade the azo dyes.

In the present study, we isolated 12 bacterial strains from soil, which are able to decolorize the azo dyes. The isolated 12 bacterial strains were studied for decolorization of the dye Reactive orange 16 in various conditions like, in complete nutrient medium, in half strength nutrient medium, in cell free extract. The decolorization of the dye was determined spectrophotometrically. Percent COD reduction of the dye was analyzed by COD analysis.

Materials and Methods

Acclimatization

Soil samples from area nearby waste disposal site of textile industries from Solapur, sewage, sludge, ETP along with compost, were collected and homogenized properly. The microorganisms from the collected samples were acclimatized in the dye Reactive Orange 16 (1%) for the period of one month. One gram of acclimatized soil was inoculated in the nutrient broth, after incubation isolation was carried-out on nutrient agar incorporated with the same dye concentration. The colonies showing good decolorization were selected for the further studies.

Decolorization of the Dye in the Nutrient Broth

The cultures isolated from the soil were inoculated in the tubes containing 20 ml of nutrient broth and 2ml of 10,000 µg/ml of dye. All the tubes were incubated for 24 hours at ambient temperatures and the percent decolorization was determined.

Decolorization of the Dye in the Half (½) Strength Nutrient Broth

The cultures isolated from the soil were inoculated in the tubes containing 20 ml of half strength nutrient broth and 2ml of 10,000 µg/ml of dye. All the tubes were incubated for 24 hours at ambient temperatures and the percent decolorization was determined.

Percent decolorization studies

Percent decolorization studies were carried out to measure the percent decolorization shown by the promising isolates of dyes within 24 hrs. The decolorized samples were centrifuged at 10000 rpm for 10 minutes in Cooling Centrifuge (BIOLAB-BL-165R) to separate cell mass. Percent decolorization of the dyes was determined on spectrophotometer (Equiptronics Digital Spectrophotometer – EQ - 822) by measuring the absorption at λ max (492 nm) of the dye. The percent decolorization was calculated using the equation,

$$\text{Percent Decolorization} = \frac{\text{Initial absorbance - Final absorbance}}{\text{Initial absorbance}} \times 100$$

Percent COD Reduction

Percent COD reduction was determined by reflux method using potassium dichromate as strong oxidizing agent[10].

Cell-free extract studies on Decolorization of Dye

The cells grown in nutrient broth were lysed by using Ultrasonicator (Sonic Vibra Cell-Germany) and centrifuged in cooling centrifuge (Remi 412-LAG) at 10,000 rpm for 10 min. The 20 ml supernatant was added with 2 ml of dye solution in nutrient broth and incubated at ambient temperature.

Results and Discussion

Percent Decolorization in Nutrient Broth

12 bacterial isolates were examined for their percent decolorization capacity in Nutrient broth + Dye 2ml of 10,000 µg/ml. The percent decolorization of the dye by the 12 isolates *viz.* ERO – 1, ERO – 2, ERO – 3, ERO – 4, ERO – 5, ERO – 6, ERO – 7, ERO – 8, ERO – 9, ERO – 10, ERO – 11 and ERO – 12 in nutrient broth medium were in the range of 54 to 90%. (Figure 1) .

Percent Decolorization in Half (½) Strength Nutrient Broth

The promising 12 bacterial isolates were studied for their ability to decolorize the dyes in half (½) strength nutrient broth + dye 2 ml of 10,000 µg/ml. The percent decolorization of the dye by the 12 isolates *viz.* ERO – 1, ERO – 2, ERO – 3, ERO – 4, ERO – 5, ERO – 6, ERO – 7, ERO – 8, ERO – 9, ERO – 10, ERO – 11 and ERO – 12 in Half (½) strength nutrient broth medium were in the range of 52 to 90%. (Figure 1)

Cell-free extract studies on Decolorization of Dye

12 Bacterial strains were studied for their ability to decolorize the dyes in Cell Free Extract + dye 2 ml of 10,000 µg/ml. The percent decolorization of the dye by the 12 isolates *viz.* ERO – 1, ERO – 2, ERO – 3, ERO – 4, ERO – 5, ERO – 6, ERO – 7, ERO – 8, ERO – 9, ERO – 10, ERO – 11 and ERO – 12 in Cell Free Extract were in the range of 30 to 90%. (Figure 1)

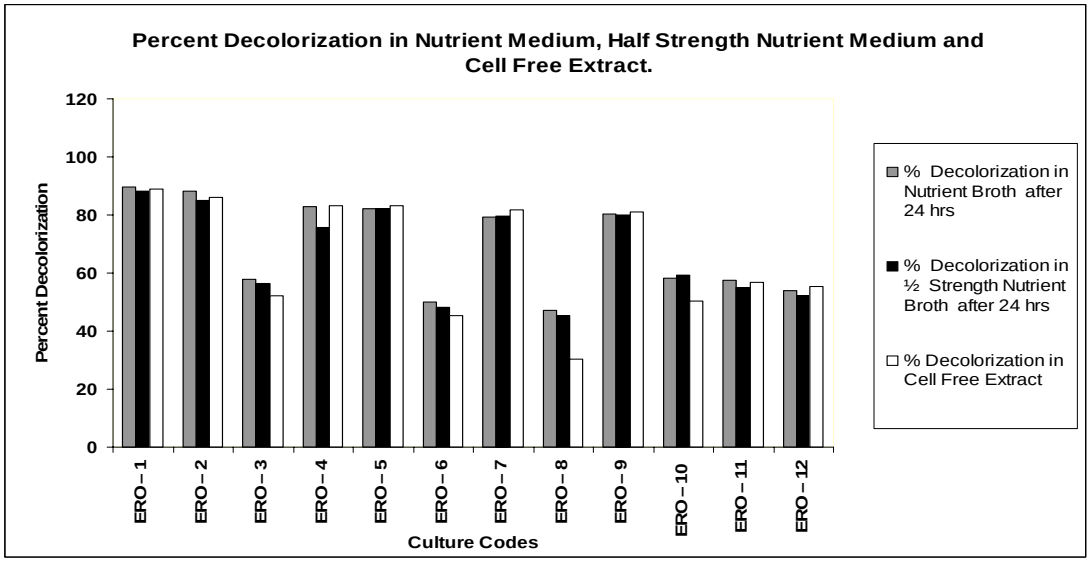

Figure 1. Percent Decolorization in Nutrient Broth and ½ Strength Nutrient Broth in 24 hrs

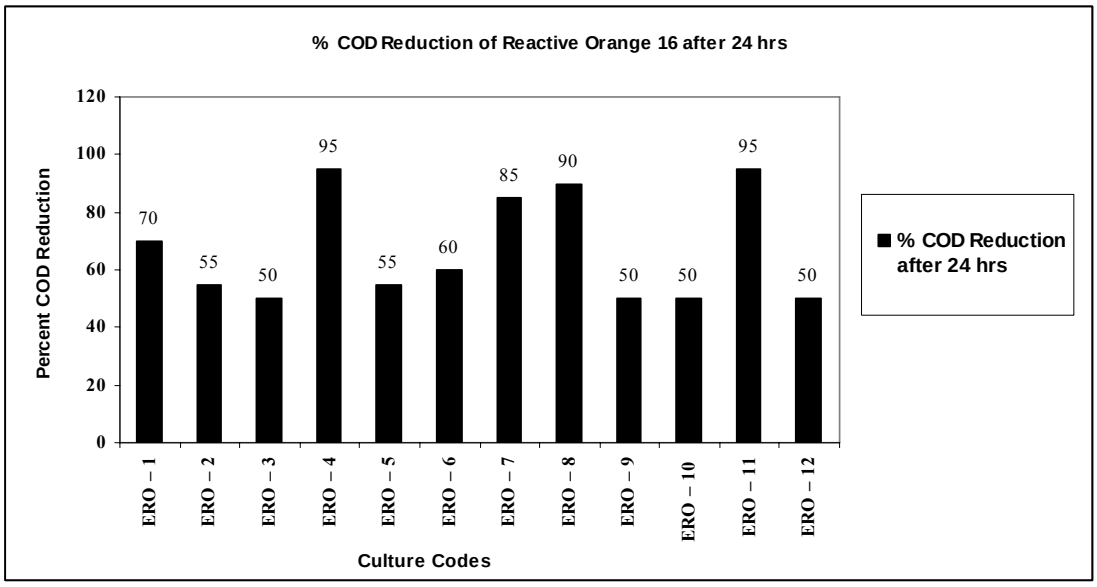

Figure 2. Percent COD Reduction after 24 hrs.

Percent COD reduction

The Percent COD reduction of the dyes after decolorization of the dyes by the 12 promising bacterial isolates *viz.* ERO – 1, ERO – 2, ERO – 3, ERO – 4, ERO – 5, ERO – 6, ERO – 7, ERO – 8, ERO – 9, ERO – 10, ERO – 11 and ERO – 12 were in the range of 50 to 95%. (Figure 2)

The experimental results showed that the isolates from the acclimatized soil showed good decolorization of the dye Reactive Orange 16. In present study, the decolorization of Reactive Orange 16 took place in nutrient medium; this suggests that the presence and

availability of a co-substrate is necessary, because it acts as an electron donor for the azo dye reduction[9].

Acknowledgment

We would like to offer our sincere thanks to University Grants Commission, New Delhi for giving us the opportunity to work on this Major Research Project. Our sincere thanks to Principal, Shri Shivaji Mahavidyalaya, Barshi and Head, Department of Microbiology for providing the Laboratory facilities.

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GIS BASED AUTOMATED EXTRACTION OF DRAINAGE NETWORK USING DIGITAL ELEVATION MODEL. A CASE STUDY AROUND LANJA REGION, DISTRICT RATNAGIRI, MAHARASHTRA

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Abstract

Although field mapping is acknowledged as the most accurate way to determine channel or drainage networks, it is often impractical and time consuming, especially for the large and remotely situated mountainous watersheds. Topographic maps, providing a useful surrogate for drainage networks, are the fundamental source for the drainage analysis. But, drainage analysis by manual delineation on topographic maps requires time and expertise, and subjectivity judgments. In this study for GIS based modeling, Digital Elevation Model (DEM) is used in presenting drainage networks, lineaments and geomorphic features. Drainage network delineation was performed using two methods: 1) Traditional method by hand delineation on 1/50,000 topographic map; and 2) Using TauDEM (Terrain Analysis Using Digital Elevation Models) model in ArcGIS 9.2 environment using SRTM DEM. The results reveal that the data extracted from the SRTM images are greatly equivalent to those obtained from the topographic maps 1:50.000 and provide more details in the lower stream orders, and morphotectonic parameters. The DEM suggests the tectonic influence on development of landscape.

Keywords DEM, TauDEM , drainage network, basin delineation

1. Introduction

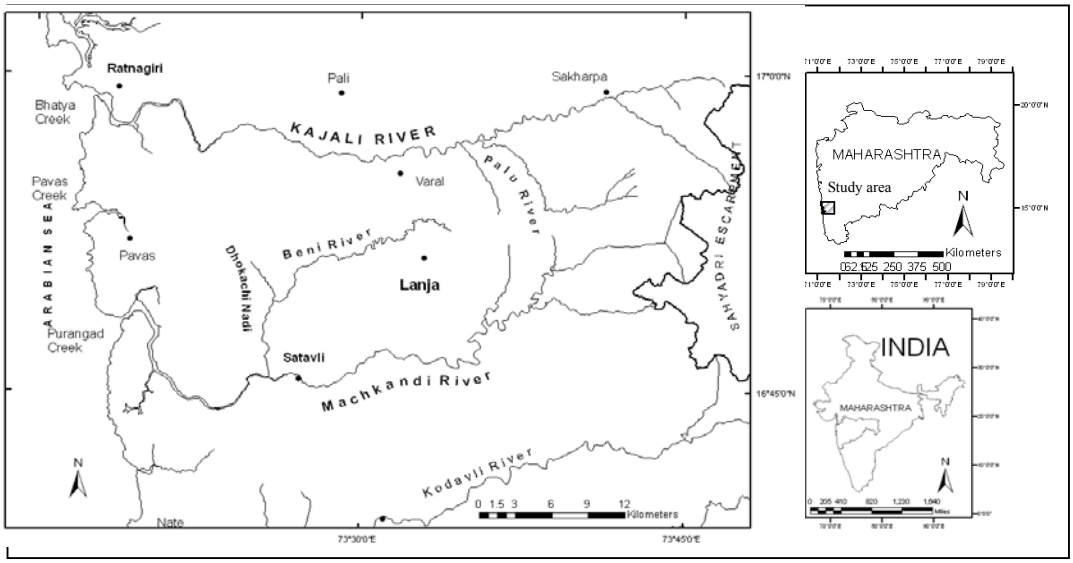
Geomorphologists and hydrologists often view streams as being part of drainage basins. Drainage basins are divided from each other by topographic barriers called a drainage divides. Tectonics plays a very important role in the morphological evolution of any drainage basin and is well reflected by structural, fluvial and morphotectonic parameters. Analysis of active tectonics depends upon the use of morphometric parameters, which are sensitive to rock resistance, climatic change and tectonic processes resulting into landscape evolution. The information about tectonic history of an area can be retrieved by quantification of different morphometric parameters of drainage basins developed.

Digital Terrain Modeling and Geographic Information System (GIS) have become essential tools for various surface and sub-surface studies in earth sciences. Concept of hydrological modeling is broadly applied nowadays to represent a digital simulation of drainage systems based primarily on terrain analysis and performing automation extraction of the drainage networks. The model executes as well stream orders, watershed, and quantifying the most important morphometric parameters of watershed. In GIS based hydrological modeling Digital Elevation Model (DEM) is used to delineate drainage networks and watersheds, morphometric parameters and hypsometric integrals to understand the tectonic setting of the study area. Analysis of the DEM relies on the fact that the physical surface determines characteristics of the flowing water across it. Direction of flow is determined by surface aspect that defines the maximum rate of changes in elevation and slope direction.

Shuttle Radar Topographic Mission (SRTM) 90 m were the primary data sources used in this study. DEM is the data files that contain the elevation of the terrain over a specified area, usually at a fixed grid interval over the surface of the earth. The intervals between each of the grid points will always be referenced to some geographical coordinate system. This is usually either latitude-longitude or UTM (Universal Transverse Mercator) coordinate systems. The closer together the grid points are located, the more detailed the information will be in the file. The details of the peaks and valleys in the terrain will be better modeled with small grid spacing than when the grid intervals are very large.

1.1 **Study Area**

Two watersheds of Kajali and Machkandi rivers were selected from the Konkan Coastal Belt (KCB) around Lanja, District Ratnagiri, in the State of Maharashtra for the present study. The



study area exposes Poladpur and Ambenali formations. (68+0.6, 65+0.7 Ma respectively) Southwestern part of the Deccan Volcanic Province (DVP) is represented by massive and amygdaloidal basaltic flows. At some places these basaltic flows are overlain by laterite capping (duricrust). Morphotectonically the DVP has been divided into three regions viz. (1) the Konkan Coastal Belt, (2) the Western Ghats and (3) the Maharashtra plateau. The KCB is coastal low-land forming narrow and elongated strip of land whose average width is about 40 km. The KCB is bounded by coastline to its west and Ghat escarpment to its east. The E-W offsets have become the site of confluence of major rivers flowing down from the Western Ghats (Figure 1). The KCB exhibits different drainage characteristics and landforms as a result of episodic cymatogenic uplift particularly during the quaternary[1]. Drainage pattern is dendritic, angular, trellis and barbed type suggesting structural control. The area is traversed by several east-west trending ridges and west flowing rivers and their tributaries with steep to moderate gradients. The most common geomorphic features recognized are raised beaches, stabilized dunes, mud flats, drowned valleys, estuaries, laterite platforms, weathered hills, hilly interfluves, cliffs, etc. Studies also indicate the presence of submergent and emergent coast formed due to sea level changes and tectonic movements[2]. Summer and rainy are two major seasons and hence weather is hot and humid. It receives 2000 to 3000 mm rainfall per year. Most of this belt is under forest and soil cover of varying density and thickness respectively. The study area is enclosed between long $73^0$15'E and $73^0$50'E and lat $16^0$40'N and $17^0$00'N

Figure 1. Location map of the study area.

1.2 Data Used

The Space Shuttle Radar Topography Mission (SRTM) gap filled data of the world at 90m horizontal resolution is available through the Consortium for Spatial Information (CSI) web portal (http://srtm.csi.cgiar.org/).

The Survey of India (SOI) toposheets (Nos. 17H/5, 6, 9 and 10) of 1:50,000 scale were also used for digitization to check accuracy of extracted drainage network from DEMs.

Ground Control Points (GCPs) are mapped with the help of GPS points taken in the field and used for preprocessing of DEM. Extensive fieldwork was carried out at selective localities showing morphologic signatures of tectonic activities.

2. METHODOLOGY

The SRTM DEM (Version 2.1) was downloaded through the Seamless Data Distribution System (SDDS) at 90m resolutions for the study areas. Version 2.1 is a recalculation of the SRTM3 (nominal 90m sample spacing) version made by 3x3 averaging of the full resolution edited data. Occasional artifacts, spikes and voids were eliminated in Version 2.1.

2.1 DEM preprocessing

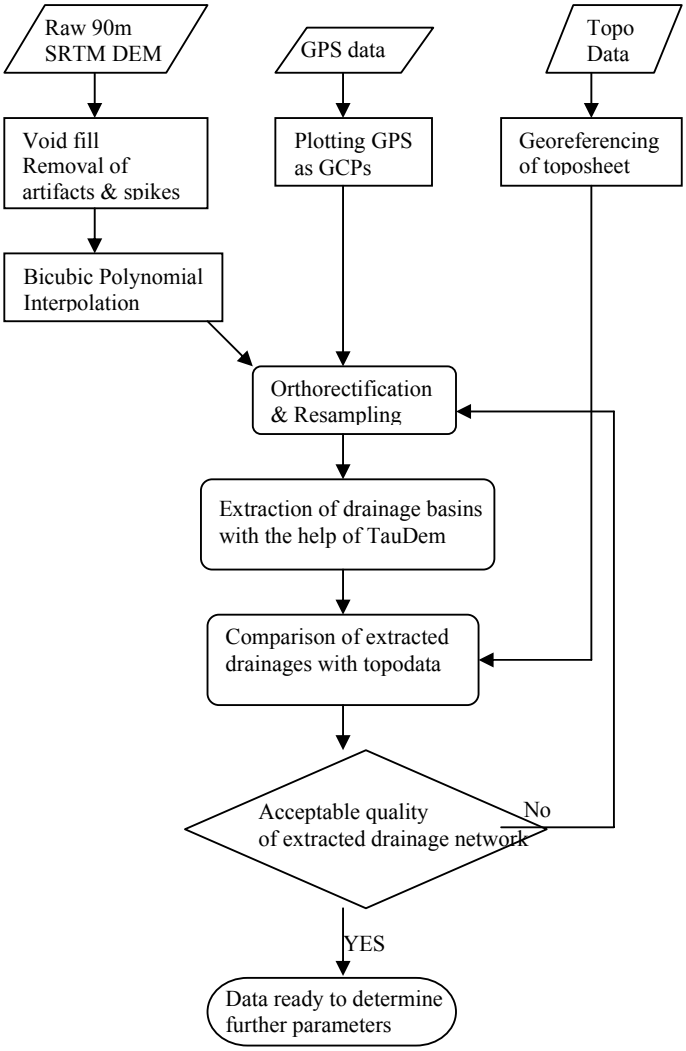
The downloaded SRTM DEMs was mosaiced in the ARC GIS 9.2 environment.

During the data finishing process[3] the following tasks were implemented.

2. Spikes and wells in the data were detected and voided out if they exceeded 100 meters compared to surrounding elevations.
3. Small voids (16 contiguous posts or less) were filled by interpolation of surrounding elevations. Large voids were left in the data.
4. Water bodies were edited. The ocean elevation was set to 0 meter and were flattened and set to a constant height.

The original data set of 90m resolution was then converted into 30m resolution using bicubic polynomial interpolation technique[4]. The resolution conversion was achieved by using ARC GIS 9.2. The higher resolution SRTM DEM helped to delineate micro topographic features and to extract lowest order streams correctly. The SRTM DEM was further orthorectified with the help of resampling technique using ERDAS imagine. The GPS points plotted in the field were mapped and overlayed on SRTM DEM in ARC GIS software. The mapped GPS points were used as GCP (Ground Control Points) for resampling. The orthorectification of the DEM was achieved by using polynomial method in ERDAS software. This process improves correctness in spatial correlation of each pixel in DEM.

2.2 Drainage extraction



Digital data (SRTM DEM) and non-digital data (1:50,0000 topographic maps) were used to extract channel networks. An extraction of channel network from digital data was carried out in the ArcGIS 9.2 environment using TauDEM (Terrain Analysis Using Digital Elevation Model) software. TauDEM incorporates the DEM analysis tools and functions developed by David G Tarboton at Utah State University for hydrologic digital model analysis and drainage basin delineation. (http://www.engineering .usu. edu/dtarb/ taudem).

Figure 2. Flow chart of DEM quality improvement and automated drainage extraction

An automated delineation using TauDEM is more sophisticated, convenient, and can circumvent the efforts on digitizing to incorporate with other GIS data. It extracts the highest resolution channel network statistically consistent with geomorphological laws by using the smallest weighted support area threshold calculated from the constant drop analysis[5]. In the TauDEM, grid digital elevation model data is used. Grid DEM is distinct from other DEM representations such as triangular irregular network (TIN) and contour-based data storage structures[6] Figure 2 represents the flow chart of the processing of DEM and

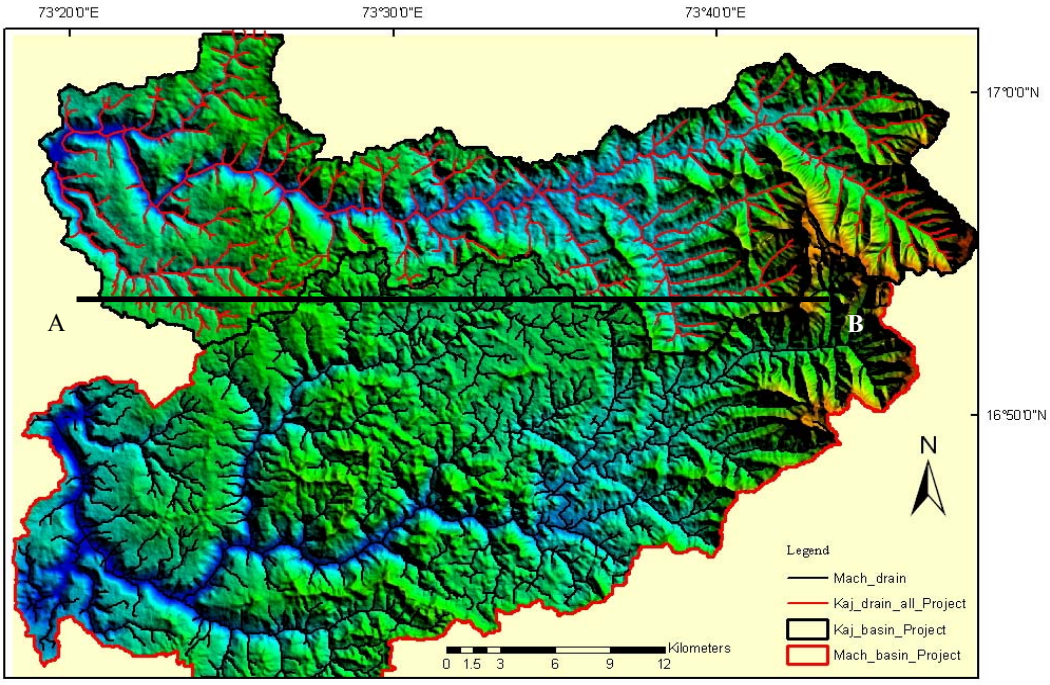
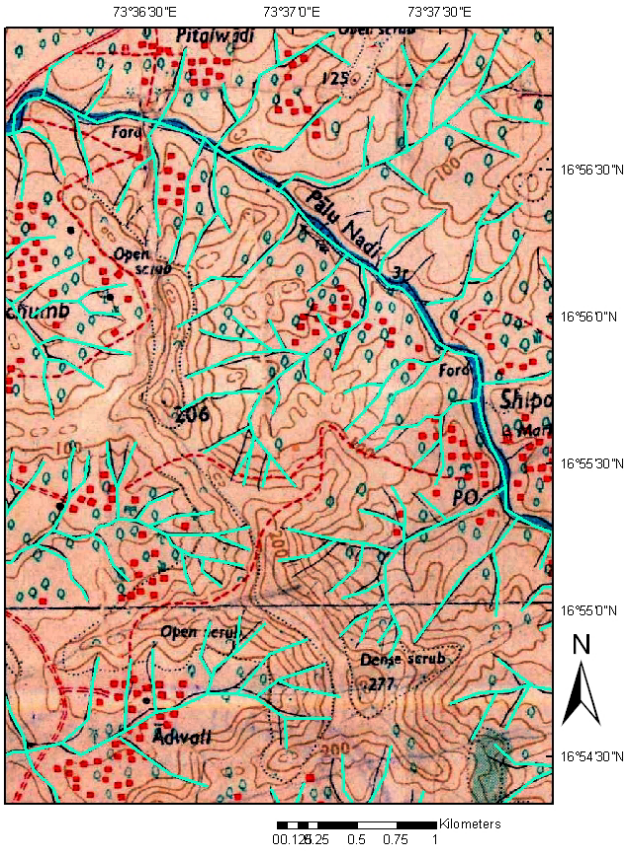


Figure 3. Drainage network and basins draped over the pre-processed DEM (30m resolution) A profile taken along line A-B (Figure 5)

automated extraction of drainage network. Figure 3 shows the processed DEM of the Lanja region and overlayed extracted drainage network. The extracted drainage network and watersheds of Kajali River and Machkandi River were overlayed on geocoded and orthorectified scanned toposheets for comparison. The drainage network derived using TauDEM shows good agreement with drainage network and basins in toposheets (Figure 4).

3. Discussions



The processed DEM generated of the study area and extracted drainage basins show various features as general slope, relative relief, and change in relief, topographic breaks, ridges and valleys with their trends, linear and curved valleys controlled by lineaments, drainage networks, density pattern of drainage network, bends and sinuosity along the streams, planar surfaces and landforms. It helps in understanding tectonic setting and distribution of major geomorphic features in the study area. The length and spatial data of the lineaments can be determined. The geomorphic features associated with lineaments can be recognized and hence it is possible to characterize the lineaments and weak planes. Thus DEM can be used as a tool for the quantitative and qualitative studies of morphotectonics and neotectonics.

Figure 5 is the drainage map generated from the DEM with the help of ARC GIS and shows good agreement with drainage network in toposheets (Figure 4).

Figure 4 Extracted drainage network overlayed to check its accuracy

The morphometric analysis with respect to basin area can be determined. Thus, by integration of both DEM and extracted drainage network it is possible to undertake quantitative geomorphic analysis such as linear aspects, areal aspects, relief aspects, geomorphic indices like hypsometric integrals, stream length gradients etc.

Figure 6 represents the digital profile across the DEM in east-west direction showing the change in relief and morphological cross section. Such cross sections illustrate the perspective view of the study area.

4. Conclusion

Thus, the use of DEM and drainage basin generation provide strong tool for the morphotectonic studies as it represents instantaneous relationship between various tectonic features, geomorphic features associated with them.

Acknowledgement

The authors are grateful to UGC for providing financial assistance through research project in the study area.

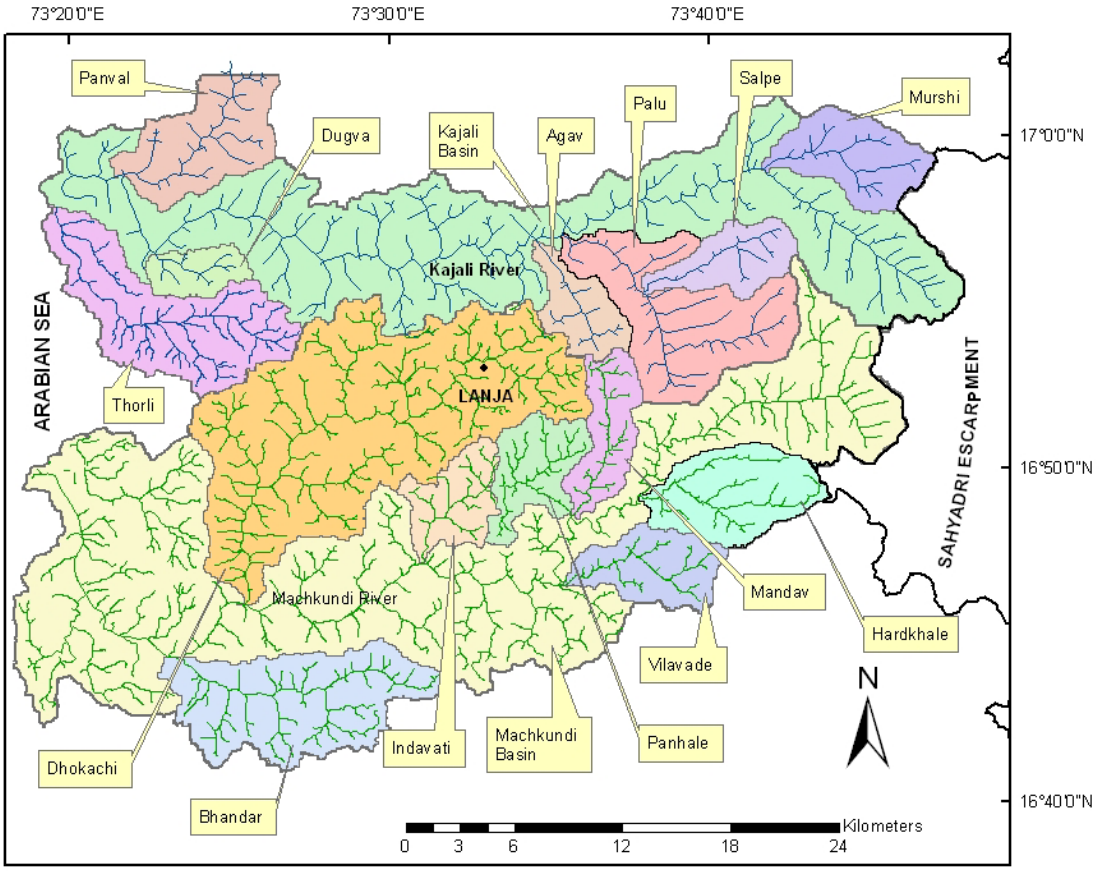


Figure 5. Drainage basins and sub-basins around Lanja.

Figure 6. A profile along A-B line shown in Figure 3

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HYDROGEOLOGY OF BASALTIC AQUIFERS, IN PARTS OF SE-MAHARASHTRA

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Abstract

Water is the essence of life on the '**water planet**' Earth. Its position as a geofactor is well known in the development of any country truly with the quantity and quality. Most of the water acts as renewable source. Large amount of freshwater available for various utility purposes is in form of underground storage i.e. groundwater.

Basaltic aquifers-shallow and deep, from Deccan Trap regions in South-East-parts of Maharashtra state, are considered as a case study to understand the availability and storativity of groundwater. As it is hidden below the surface, it is most ignored and presumed to be available in safe form by the masses.

The geohydrological studies reveal that the type of flow units, presence and extent of fractures and joints, the depth and extent of weathered mantle, variations in porosity and permeability of flow and flow units are the major controlling factors for groundwater availability, behavior and movement in Deccan basaltic region.

In general the groundwater available in most of the areas in SE parts of Maharashtra is fresh and potable.

Keywords Hydrogeology, Basalt, Aquifer, SE- Maharashtra.

Introduction

Maharashtra state is one of the leading states of India bounded by North latitudes 16º 4′ and 22º 1′ and East longitudes 72º 6′ and 80º 9′ covering an area of about 3,07,690 Sq. Km. There are total 31 districts and 303 tahsils. It is one of the leading states in the country with respect to groundwater utilisation for domestic, industrial and agriculture purpose.

Attempts are made to study various hydro-geological characters of basalts through geological, geomorphological, geohydrological and geophysical studies from parts of Solapur, Osmanabad, Sangli and Satara districts. The study areas include morphologically variable hilly terrains, plateaus, valley basins and sloping grounds. Extract of various studies is discussed herewith.

Hydrogeology

The Deccan basalts consist of a number of flows separated from each other at some places by inter-trap ash beds and ancient buried soils (red bole). The red bole which generally occurs in the upper part of pink Zeolitic basalt varies in thickness from few cm. to about 1 m. At places it also occurs as stringers or veins within basalt.

The origin of red bole is controversial. In all probability, it is a product of atmospheric weathering representing the ancient soil profile which was later buried under the next younger flow. This might have also caused the baking of the underlying soil to some extent due to which typical columnar jointing is developed in red bole in some sections.

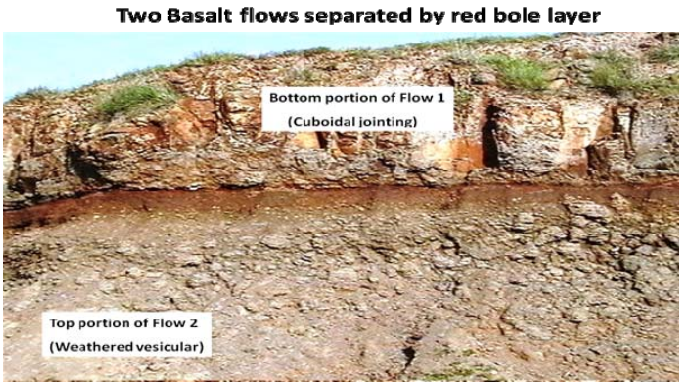

Photo 1 Location – Naldurg – Osmanabad District

Hydrothermal alterations might have also been responsible to a limited extent for the formation of red bole.

As the permeability of red bole is poor, it usually forms confining layers. At places where it has joints, it forms moderate to good aquifers.

The individual flows vary in thickness from less than 1 m to 35 m; the average thickness of the individual flow unit is 15 m. The individual flows has a greater areal extent. Some of the flows have been traced for distances more than 100 km.

The flows are generally horizontal to sub horizontal. The basalts composing various flows vary in texture and colour from glassy, fine to medium exceptionally coarse nature and dark grey to purple, pink to black, respectively.

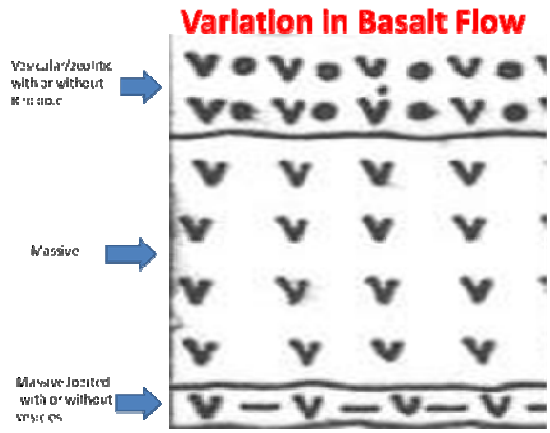

Figure 1-Variation in flow units in Basalt flow

The different lava flows and flow units can be separated on the basis of their lithological characters. In general the top of the flow is either marked by vesicularity, flow breccias, clinkery surface, shrinkage fractures and / or red bole/ clay layer. The vesicles are rounded, irregular or tubular (pipe) and may be filled with secondary minerals like zeolites (stilbite, apophyllite), calcites, and secondary silica (chalcedony, agate, opals etc.) giving rise to amygdaloidal form at places.

In a single lava flow the various flow units separable are as follows (Figure 1)

1. Upper part of the flow with vesicular, Zeolitic-amygdaloidal basalt with or without red bole and/or brecciate and tuffaceous – clinkery material, with closely spaced fractures. (Photo 2 a- Zeolitic/Clinkery Basalt- Arabali- Osmanabad District)

Photo 3- a) Zeolitic / clinkery basalt (Location- Arbali, Dist. Osmanabad) b) Massive basalt (Location- Hipparga, Dist. Solapur)

2. Middle part of the flow with massive, compact basalt without fractures or very less fractures. (Photo 2 b- Massive Basalt- Hipparga- Solapur District)

3. Lower part of the flow with massive, compact basalt with widely spaced fractures or cuboidal jointing. (Photo 1:- Location – Naldurg – Osmanabad District)

On regional scale the lava flows are horizontal in nature and exhibit stepped terrace appearance, but show variation on local scale with gentle dips at places The variations are mainly traceable in thickness of flow units, laterally and vertically. Weathering in basalts horizontally and at depth varies with the variable conditions of climate, topography, lithological variations as different flow units, texture, soil cover thickness and chemical composition.

Photo 3 – Cross section of a typical large diameter Dug well in Basalt (Location- Babhalgaon, Osmanabad District)

The bottom of the flow when exposed at or near the surface due to cuboidal nature of jointing, spheroidal weathering dominates, resulting in formation of large or small core stones.(Photo 1- Location- Naldurg- Osmanabad District).

When the rocks are exposed near the surface, then due to weathering and stress release, sheet joints and open fractures are developed, which may extend at shallow deeper depths. (Photo 3- Location- Babhalgaon- Osmanabad District).

Fractures in lava flows may be interconnected vertically in the different lava flow units of the same flow and/or in adjacent lava flows occasionally. Otherwise, normally the fracture pattern of one flow is not continued in the second flow at depth.

The interconnection of pores/fractures near the surface, in weathered mantle and flow contacts and various flow units; make the basalts good aquifer and reservoirs. The open fractures and its networking may act as conduit to give rise to transmission or percolation of sufficiently large amount of surface water at depth and in lateral extension to provide good storage facilities. As the conditions of primary and secondary porosity in basalt vary from place to place they vary widely in permeability too. The ground water conditions especially at shallow depths are studied in details.

The formations are thinner or thicker, vertically and also laterally. The lateral gradations are of great significance with respect to the occurrence and movement of groundwater. Sediments or former erosional /depositional surfaces and ash or altered glassy zones between the lava flow units, greatly modify the porosity and permeability of basaltic aquifer, essentially at depths. Sealing of fractures due to siltation, mineralization, precipitation of salts etc. in geologic time, reduces the porosity and permeability of the aquifer. Similarly as the fracture intensity decrease with depth along with the compaction, the movement and availability of groundwater retards.

There are important differences in the same formation at different horizons and in different localities. The primary and/or secondary openings are irregularly distributed and/either are interconnected or remain isolated horizontally and also vertically. Erratic pattern of weathering, variations in flow units and their thickness and haphazard interconnections or isolations of pores and fractures, lead to the heterogeneous nature of aquifer characters, in basalts. And therefore it is commonly observed that some dug wells / bore wells may yield less or negligible amount of water, in spite of deeper penetration, in respect to nearby wells / bore wells yielding high amount of water with either shallow, partial or deeper penetration.

However, it is nature's gift that these rocks will definitely yield either small or large but reliable amounts of water to dug wells i.e. seasonal availability, even at high altitudes. Deeper excavation of dug wells below the aquifer act as storage in critical time at least to fetch water for drinking. Due to multi layer aquifer system, existence with the presence of multiple lava flow units at depth, the bore wells penetrating at deeper depth upto100mts. (330 feet) or more in exceptional cases from the surface are yielding sufficiently good amount of

water in large parts of Deccan basalts in suitable morphogeological conditions and preferably intersecting two or three lava flows.

In basaltic aquifers large amount of water is available under unconfined conditions compared to confined conditions. Many times even at confined conditions large amount of water is available under special conditions. Due to such erratic occurrences, many researchers accept the concept of leaky aquifer, in between the unconfined and confined conditions. Dating of the water available at depth is not available for basaltic aquifer, but probably the waters accumulated at depth in large amount may be during the suitable conditions in the past geological time and hence can be termed as "Fossil Water" i.e. stored water. Extracting such ground water may be considered as mining of water. It is observed that with the highest and continuous rate of pumping out of water, for use from such deeper aquifers has resulted in total evacuation and the bores are abandoned at many places in the study area. Delineation of such characteristics, though complex, seriously needs the immediate attention.

Groundwater table fluctuations in basaltic aquifers are dramatic. During the precipitation, literally the dug well/bore wells overflows in low line and planation areas under the suitable conditions, while they go totally dry in summer. Such heavy fluctuations in water table affect the yield and availability of water throughout the year. As the yield and availability of groundwater, varies with the change in conditions and as erratic manner, the water table contouring and basinal movement of groundwater, as normally accepted by the researchers, is not true in the Deccan basaltic field. The yield of wells/bore wells even in small area varies abruptly. Therefore with the field experience and experiments, it is felt that the micro-basin approach, considering the aquifer characters, its extension-lateral and vertical, must be considered. The field observations confirm the occurrence and availability of water in pockets or small basins/chambers with or without interconnections i.e. may be interconnected or isolated. The massive units, isolated fractures and other related features, hinder the movement of water laterally and vertically, so that storage of water and its movement are restricted. With such conditions isolated pocket occurrences of groundwater are seen in basaltic rock terrain, laterally as well vertically at depths. However during monsoon due to heavy replenishment on and near the surface, groundwater table continuity results – which is a temporary phase.

The detailed study of aquifer parameters analyzed by various standard methods from representative shallow dug wells situated in different flow units and flows reveal that there is a linear relationship between transmissivity v/s storativity and specific capacity. However

scatter of points results due to heterogeneity in basalts confirming lithological control on storage and distribution.

The overall studies reveal that groundwater of basaltic aquifers are potable and useful for irrigation too. Due to natural hardness and high amount of TDS at places, it requires some treatments. With the suitable treatment even it can be used in industries for special purpose.

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EXCAVATION AT WAKAV

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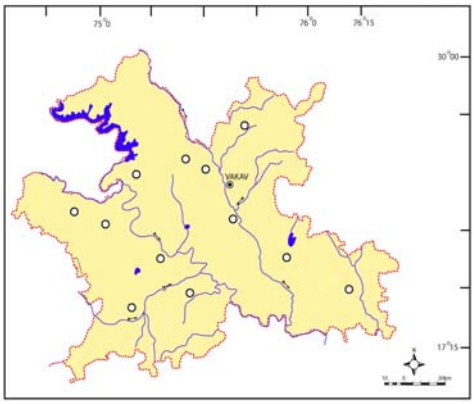
Abstract

This pilot study presents an Wakav excavation. Wakav is a small place in Madha Tahasil in Solapur District . Objectives of this excavation is to decide the historic & cultural sequence, along with economic conditions, trading and study of the social life . For this excavation Trial Trench Method, Step Trench Method and Horizontal excavation method is used. This paper endeavors to understand objectives of this project.

Keywords Wakav, excavation, cultural sequence, trial trench method, step trench method, horizontal excavation.

Introduction

Archaeology is the study of things created by man in the past. History is study of written things where as archaeology is study of unwritten things. According to Gordon Childe "Period covered by written records is at best one hundredth part of the time during which men have been active on our planet . Archaeology surveys a period of a hundred times as long". Archaeology is dependent on science and technology. This science crosses the limiting barriers like Caste, religion, province or country. It includes study of Stone Age, Chalcolithic age, caves, temples, sculptures, ancient paintings, stupas, forts, etc. Paleography, coins and excavation are studied. Excavation is very important in archaeology. With excavation, man's past surfaces in the present. Excavation helps in knowing the human society which existed thousands of years ago along with eating habits then, clothing ornaments, occupation and the relations with each other.



Location and Status

Wakav, Madha Taluka, Solapur District, Maharashtra
(17° 10' N and 76° 37' and 76° 15' E)

The site is not protected

Solapur district has cultural background and is archaeologically rich. Ancient culture had flourished in the basins of Bhima, Seena, Mann and Neera. In ancient times, this region was known as "Kuntal-Desh".

An excavation took place at Wakav, Taluka Madha, district Solapur from December – January (2010-2011), under the guidance of the authors of this article. Wakav Taluka Madha District Solapur is a small village on the shores of river Seena at $17^0$10 N latitude and $75^0$15 E longitudes. The excavation site is behind 'Gundeshwar' temple which is Shiva temple from past Yadava period.

Objectives of this excavation

- To decide the historic and cultural sequence, along with economic conditions, trading and study of the social life .
- To decide the sequence of proto history and early history.
- To study the early and medieval history with reference to excavated evidence.

Excavation Method and findings

The following excavation methods were used

- Horizontal excavation method
- Step Trench method
- Trial Trench method

In the beginning of an excavation, trail trench method is used. Because of this we can identify the sequence of various settlements which further gives us an idea to decide the method of excavation. Trial trench method followed by horizontal method in excavation. Horizontal method is used in excavations because it takes place on a large area and it helps studying phase wise past culture. The excavation took place at seven difference places within Wakav because the land in between is under intensive cultivation, thus destroying the layers because of use of tractor. It has been observed that there were 8 layers of settlements. Many times the human settlements get destroyed because of natural calamities like flood, famine, earthquakes etc. Under such circumstances the people shift to some other places. After a period of time the normalcy gets restored and a new settlement is created. People go there build houses. Due to their day to day activities there is a change in the soil colour. After some time these settlement becomes a mound. Usually human settlements are found near the water source with food availability in the vicinity.

The height of this mound is 5-8 meters with east-west 100m and north-south 90m length. Out of 7 excavations A2 trench was 3m deep whereas B2 was 2m deep. These

trenches were 5x5 m . C2 measured 4x3. And the step trench on the slope of the mound measured 1x10 m. Apart from this there were YX, 'D', 'G' and various other trial trenches at four places .

During the excavation floors made for houses were found. A kiln was found in A3 trench. Red polished vessels filled with ash, were found in C1 trench .Thereafter, pieces of pottery were found which redwares, blackwares, brown are grey coloured.

A toy bull – 7cm long and 6 cm wide, made form terracotta was found. This antiquity had a belt around its neck with intricate designs on upper side and on its tail.

Besides this, toy wheels were also found. A terracotta headless sculpture of mother Goddess (*Matrudevata*), a 'Sprinkler', (G*ulabdani*) coated with red colour along with excellent sculpture of toys like horse, an elephant, a bird etc were unearthed during this excavation . Each trench had pieces of varied shell bangles, some with beautiful designs etched on them while others were plain. Shell waste was found at a few places. A wide range of beads like: Fiances, Lapis Lazuli, Carnelian along with fired terracotta beads and ornaments like flint-pendants were discovered. Other things that were found include bones of animals like bull, sheep, rabbit, mice, small triangular pieces made from bones, which were used to engrave the designs on the pottery; small triangular pieces made from bones, which were used to engrave the designs on the pottery; coal muller (*pata-warwanta*) and blades made up of flint stones – which are known as microliths.

Discussions

The above mentioned material that was obtained through this excavation proves existence of a civilization with the main occupation being farming. Grains like Mung, wheat, masoor, waal etc. and crops like wheat and jawar were cultivated. (The evidence for this was preremnants of the burnt grains that were discovered during the excavation) Other occupations were like making bangles, toys and iron articles manufacturing along with pottery making were also there. Trading must have also taken place. This can be proved with the shells brought from sea shores and the existence of the bluish semi-precious stone like Lapis Lazuli (it is found only in Afghanistan and Iran) Bricks which had been dislocated from their original place have also been found . It's inferred that the settlement at this site was from early history to fifteen century A.D. We got early historic pottery from the site. But we could not get the layer because that layer was destroyed. We will get historical sequence of Solapur district from excavation of Wakav soon.

Conclusion

The excavation findings clearly indicate existence of a Civilization which had occupation of farming, trading and many small scale industries. They cultivated Wheat, Moons, Masoor, Wal, Shelll bangles and glass bangles, terracotta pottery and toy industries. They had social life people with various occupations used to live together wakav was self reliant village .This excavation proves existence of early history period and not of Chalcolithic period.

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THE MARTIAL LAW OF SOLAPUR AND THE MILL WORKERS

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Abstract

Solapur is known for the textile industries all over India. During the second half of the 19th century the city of Solapur witnessed the rise of modern textile industries. During the First World War the weaving industries saw a further growth and development. The number of mill workers in the five big mills in Solapur is supposed to have been around 40,000. The mill workers had been well oriented in the national movement. The establishment of the workers' unions had created a kind of integrity and unity among them. The mill workers of Solapur rose in revolt against the British rulers in the wake of Mahatma Gandhi's arrest in 1930. The resistance offered by the mill workers was so intense that the British government had to invoke the Martial Law. The conflict between the mill workers and the British forces has been considered to be one of the most memorable events in the History of India's freedom struggle. Four of the leading activists of the movement viz Mallappa Dhanshetti, Srikishan Sarada, Kurban Hussein and Jagannath Shinde sacrificed their life for the sake of India's independence. One of the special features of Solapur is that the city enjoyed 'three days' of total independence' during the period of the struggle. The present paper is aimed at bringing out the extraordinary dedication and patriotism shown by the mill workers in the national struggle against the Imperial Britain.

The modern Solapur is known for its cotton mills. However, the history of the weaving industry goes back to the Medieval Period, especially the hand-woven 'dhotis' were well-known. Madhavrao Peshava brought a number of weavers from other parts of India and made them settle in Solapur during the Peshava Period. He is also known to have set up Madhav Peth, a business complex. The first modern mill got under way in Solapur during the second half of the 19th century. The cotton cultivated mainly by virtue of the lakes dug by the British government, the railway and the cheap and skilled labourers were some of the favourable conditions which motivated several capitalists to set up cotton mills. The Solapur Spinning and Weaving Mill (The Old Mill) was the first cotton mill established in 1976. It was followed by the establishment of the Narsingh Giraji Mill, the Laxmi Mill both in 1898, Vishnu Mill in 1910 and Jamshree Ranjitsinghji Spinning and Weaving Mill in 1909. The afore-stated five cotton mills changed the reputation of Solapur[1]**.** Solapur came to be known as the city of workers. The mill sirens ran the schedule of the city dwellers. The cotton industry in Solapur flourished during the First World War, since the demand for cloth went up. As a result, the number of workers got multiplied. The city witnessed four thousand workers working in different mills.

It was in the year 1920 that Solapur saw a long-term strike under the leadership of Bhimrao. Although, the strike was fruitless, it created a kind awakening among the workers about their rights. The first efforts at forming a workers' union in Solapur were taken by one of the assistants of Bhimrao, namely Chand Appabhai. He represented the workers of Solapur at the All India Trade Union Congress held in 1920. He set up the first workers' union of Solapur in 1922[2] Afterwards, Raghunathrao Bakhale, N.M.Joshi and Bhai Beke worked for

workers union in collaboration with Dr Antrolikar. These leaders woke the workers to their rights and the required confrontation thereof. This gave rise to the long-term strike in 1928. The workers of Solapur participated in the national freedom struggle too. Dr Antrolikar was one of the workers' leaders and a source of inspiration. Thus, Solapur, which happened to be the third industrial city after Mumbai and Ahamedabad, kept responding to the appeals of the leaders busy in the freedom struggle. As a consequence, the striking workers during Bhimrao's strike had met Lokmanya Tilak. The patriotic workers of Solapur, who had a role to play during the Civil Disobedience campaign, made the city proud of them.

Mahatma Gandhi gave the call for Civil Disobedience campaign against the terrorizing policy of the British government. The Salt Satyagraha launched by the Mahatma paved a way for the Civil Disobedience campaign. Solapur kept abreast of the national developments. Gandhi was arrested after he made the announcement of the Dharasana Satyagraha. The news of Gandhi's arrest reached Solapur and Shrinivas Kadgaonkar, a local Congress leader, undertook demonstrations to condemn Gandhi's arrest. A garlanded photograph mounted on the horse-driven carriage was the main feature of the procession undertaken. The procession grew in its length and width as it went onwards. The leaders of the Congress had been trying to pacify the mob. This happened to be the time for the workers to join their work. When this procession reached the Narsingh Giraji Mill, the workers about to enter the Mill gave up the duty and joined the procession, having been inspired by the national emblems, the appeals, the patriotic slogans and songs and an inspiring atmosphere[3]

This procession undertaken on 6th May marched towards the Laxmi Vishnu Mill. The demonstrators started to incite the workers to join them for condemning Gandhi's arrest. When the demonstrators saw that the Laxmi Vishnu's workers were not responding to their calls, there broke out a physical conflict between the jobbers and the workers. The management of the Laxmi Vishnu Mill called the police. The police had to take recourse to light lathicharging and aerial firing. The angry mob then went to the station and halted the Madras Mail. However, the mob went away destroying the *shindi* trees on the way. The mills and market in Solapur remained closed on account of this rioting. The entire day witnessed small-scale eruptions of processions and slogan-shouting.

The Congress held a meeting at the Tilak square. The leaders- Jaju, Rajwade, Dr Antrolikar, Ashappa Irabatti, Kavi Kunjvihari, Qurban Hussein, Jagnnath Shinde and others delivered speeches. The Congress Committee appealed to the Solapur people to maintain peace on the following day, being cautioned by the fiery speeches of the previous night and

their possible consequences[4] However, due to the demonstrations and speeches the air in the city had already risen high.

The patriot Jaju, Tulashidas Jadhav and others were appealing for peace and tolerance. But, people's rage kept growing. A riot broke out near the Laxmi Vishnu Mill on 7th May which was followed by a conflict between the police and the workers. The demonstrators went to the railway quarters and set the toll booth on fire. The demonstrators were mocking at the police. At some places the police were made to wear the Gandhi caps. There were arranged meetings and demonstrations through out the day. All in all, the anti-British atmosphere prevailed.

Solapur gave angry reactions to the arrest of Veer Nariman and Jamanalal Bajaj on 8th May. There was carried out a procession involving exhibition of the photograph of Veer Nariman by Jagannath Shinde, Kavi Kunjvihari, Qurban Hussein and Dr Antrolikar. Ramkrushna Jaju, Rambhau Rajawade, Tulashidas Jadhav, Sheth Gulabchand, Malappa Dhanshetti and others took part in the procession. The procession was too huge to be controlled by the leaders who had undertaken it. One of the factions of the procession went destroying the *shindi* trees, when the procession reached Bali square. Being apprised of this development, Mr Night, the then Collector of Solapur went to the spot with police force. The leaders of the procession had no idea about these developments. Nine of those demonstrators were held by the police. It was a fact that all the arrested were not the Satyagrahis. The mob demanded the police to set free the arrested men. It was a mob of around nine thousand people. When Shankar Shivdare, a young demonstrator, went to the Collector pleading release of the arrested persons, he was shot dead. The mob now became highly angry. Malappa Dhanshetti had to intervene and save Collector's life. However, the thankless Collector ordered the police to fire, before he went away. Several demonstrators got injured in the police firing.

The irate mob then killed two police constables of the Mangalwar Peth police station and they set the station on fire. The mob went to the court and burnt the documents there. It destroyed the wine shop in Shukrawar Peth. The British officials had to take asylum at the railway station, in order to save their lives. Mr Night ordered further police firing in the city. A total of 103 fires were shot which killed twenty five innocent persons and injured fifty[5]

From 9th to 12th May Solapur hardly had the governance of the British. The Congress Committee, in the absence of the British administration, managed the transactions in the city, including the traffic. Thus, Solapur was the only city in India to have experienced independence of four days before the nation got free. At 8.30 pm on 12th May the Martial law

was enforced. The leaders were arrested. The first blow had to be received by the mill workers. On 13th May the workers, who started for their daily duty, had to face the wrath of the military. The use of Gandhi cap was banned. Tulashidas Jadhav, Secretary, Congress Committee, was beaten, because he had refused to remove the Gandhi cap. Jagannath Shinde, Malappa Dhanshetti, Qurban Hussein and Kisan Sarada were tried and awarded death sentence for their alleged participation in the demonstrations in Solapur. The other leaders too were punished.

Qurban Hussein, one of the convicted youngster, was a disciple of Dr Antrolikar, the workers' leader[6] Jagannath Shinde too was a mill worker. Narayanrao Adam, the demonstrator who took an active part in setting the police station on fire was a mill worker. Tulashidas Jadhav, who had said no to removing the Gandhi cap, too was a mill worker. Kavi Kunjvihari, the famous poet known for his patriotic poetry, was another mill worker. He was announced one year's rigorous imprisonment and a fine of Rs. 2000/-. Dr Antrolikar, who motivated and led the demonstrations in the city, was a leader of the mill workers. It was the workers unity which happened to be the backbone of the Civil Disobedience campaign in Solapur. The considerable participation of the workers in the national struggle inspired one of the Russian leaders to declare the city as 'Solapur Commune'.[7] The workers showed limitless patriotism and dedication to the national struggle. The intensity of their devotion made Solapur free of the British governance for four days. The British administration had to use military power and clamp Martial Law. The history of Indian freedom struggle has celebrated the Solapur workers struggle against the British governance in red letters. The martyrs of Solapur have equaled the sacrifice of Bhagatsingh, Sukhdev, Rajguru and others. As a result, Pandit Nehru recognized Solapur as 'Sholapur'. Thus, the struggle, which was realized by the mill workers of Solapur, has been recognized at both national and international levels.

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LANGUAGE OF PEOPLE: A NATIVISTIC LITERARY CANON

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Abstract

The root of Indian languages is found in native tradition. So language of people acquires an important place in nativism. Nativism advocates that one should write in native language, first language i.e. in the language of people as naturally as breathing. Though there is great importance given to the language in nativism, it expects the language of huge group of people. The language of the high class that has been corrupted by the influence of Brahmo-English is not expected. As common men were unable to understand Sanskrit, Gautama Buddha (*Pali*), Mahaveera (Ardhamagadhi), Basaveshwara (Kannada), Jnaneshwara and Chakradhara (Marathi) and so on used the language of people. Nemade's nativistic anti-English attitude is Gandhian, which draws our attention to the central literary process in the Indian languages which are deeply rooted in the life of the people with the tradition of two thousand years. Mahatma Gandhi's awareness about native language was extremely mature. That is why in his education plan the study of mother tongue is at the forefront. He also advocates that the medium of instruction should be the mother tongue.

Language of People : A Nativistic Literary Canon

Nativism seems to have been gradually emerging in recent years through the collective efforts of intellectuals like M.N. Srinivas (in Sociology), Romila Thapar and Ranjeet Guha (History), Anil Seal and Partha Chatterjee (Political Science), Sudhir Kakkar (Psychology) and Meenakshi Mukherjee and Bhalchandra Nemade (Literary Criticism). *Nativism* goes farther than Internationalism and appeals not only Internationalism but also Universalism because it has an important role to play not only in literary criticism but also in the other areas of our intellectual endeavour. The present work is a beginning in the direction of formulating a well-considered and multi-dexterous response to the serious cultural challenges of our times. The present researcher would explore the Socio-Economic ideologies which connect with the power structure and power relations in India, since the cultural conflict between center and periphery proves literature as an institution.

While introducing what modern India has offered to the world by way of literary achievement, John Oliver Perry, in his article in the *World Literature Today* has pointed out that:

> *Deshivad* (*nativism*) is the positive term advanced by Bhalchandra Nemade to start a nationwide literary movement emphasizing India's many regional languages and cultures, a movement just now being widely recognized and challenged[1].

However, M.H. Abram's *A Glossary of Literary Terms* (1993) does not contain site any reference to *nativism*. Even the fourth edition of J. A. Cuddon's Dictionary of Literary Terms and Literary Theory (1999) does not include it. This volume has included all the –isms: from the period of Aristotle to the present one, but it fails to pay any attention to nativism.

Bhalchandra Nemade is one of the celebrated novelists, poets and distinguished critics of India. He is, definitely, an unusual phenomenon in the contemporary Indian literature. He is the only thinker who has made much impact on contemporary intellectuals and litterateurs. He advocated *Nativism (Deshivad)* in modern literature. No doubt, he gave keen practical insight and systematic treatment to modern literature. His literary theory, *Nativism,* is logical and analytical, which greatly influenced the modern literature. He launched the concept *Nativism* in literature. The systematic Marathi literary criticism too begins with him. He has written the famous novels *Kosala, Bidar, Hool, Jarila*, *Jhul* and *Hindu.* These works are highly welcomed because they are rationalistic commentary on the theory of *Nativism*. His theory is certainly inspired by Mahatma Phule, Mahatma Gandhi and Gautama Buddha. Definitely, his theory is applicable to the literary life of India. It would not be wrong to call his theory the richest but rare treasure to Indian literature. In a word we may say that Bhalchandra Nemade is the father of *Nativism*. This revolutionary but the challengeable concept has created revolution in Indian *Bhasha tradition*; when it was emerged. In this article an attempt has been made to study, analyze and assess Language of People as a Nativistic Literary Value in Indian critical discourse.

Language of People

The root of Indian languages is found in native tradition. So language of people acquires an important place in nativism. Nativism advocates that one should write in native language, first language i.e. in the language of people as naturally as breathing. Regarding why a Marathi writer should write in Marathi, the views of renowned vocalist Lata Mangeshkar are very significant. In her inaugural speech at *Akhil Bharatiya Marathi Sahitya Sammelan*, held at Alandi she said,

> It is painful to note that Marathi language, in which thousands of literary types such as saint poetry, panditi poetry, ballads, modern poetry, story, novel, essay etc. were and are being written, has deteriorating condition in the present era. Marathi medium schools lack students and parents strive to get admissions for their children in English medium schools. If it is possible for us to get the nourishing milk of our mother, why do we drink powder milk? The country has got freedom, but won't our Psychological slavery end?[2]

For the first time, it seems that Lata Mangeshkar has openly placed nativism in *Sahitya Sammelan*. Is it a need of her own, culture or of Marathi people?

While raising some objections against nativism Ashok Shahane, in an interview taken by Manohar Joshi, Nitin Rindhe and Abhijeet Deshpande admitted that Bhalchandra Nemade is the father of Nativism. In the same interview he further says,

'Nowadays, Nemade, Patil have advocated that one should write in one's own language. They have not considered a simple thing that approximately each individual from the country is bilingual. It is the problem of the person who writes, the writer has the wish to select the language. Haven't we accepted Nemade's writing though he has written in Marathi instead of writing in Ahirani? [3]

As Shahane says each individual from our country is bilingual, then he might ask why Laxman Mane has not written *Upara* in Kaikadi language? He might say that *nandiwale, vadar* should write in their own language. Konkanis[1] have written in Konkani. Later Konkani acquired the separate status of language also. *Vadar, Nandiwale,* native musalman etc. groups and also Marwadi and Sindhi are living in Maharashtra. They have to get education in Marathi. As their linguistic culture is created in Marathi they have to reflect themselves from this language only. Each individual from India is not only bilingual but a polyglot. In this connection Nemade says,

> As our village was situated at the border of Madhya Pradesh, Gujarat and Maharashtra, there were Hindi, Urdu and Marathi languages in use. Our Marathi was considered a dialect of Gujarati. But a British officer, by mistake, thought it a dialect of Marathi and our village was pushed into Maharashtra. Actually it should have been there in Madhya Pradesh and I would have become a Hindi speaker then[4].

It can be admitted that in such circumstances Nemade might have become a Hindi writer. In this regard Makarand Paranjape's stand seems appropriate. According to him, 'the distinctions between different languages themselves seem to be extremely difficult to fix: for example Hindi and Urdu, Braj and Hindi, Marwari and Gujarati, and so on. That is why major figures like Vidyapati and Meera are claimed by more than one region and linguistic community[5.]

It means that the social groups in India are basically polyglot and the writer who gets the opportunity to express himself uses the language of that group. Basically language is custom oriented and approved by people. So the language of people of that particular land becomes the medium of expression. P. E. Sonkambale has written his auto-biography in Mahari-dialect. Sonkambale got the scope to use this real native-Marathi because of nativistic movement only. Had he written it in Brahminized standard Marathi, it would have become a pseudo work, devoid of linguistic action. Makarand Paranjape says that there is a persistence

of one language in nativism. The impact of literature produced in native language was influential up to the advent of Britishers; there was a fruitful interaction between Indian languages. So Namdeva-Vidyapati and Meera composed bilingual verses. Similarly Kabir, Gurunanak, Rohidas and Jafar also composed bilingual verses. But it is important to note that all these languages were native, not foreign. The roots of all these languages (Punjabi, Hindi, Bengali, Gujarati, etc.) are in India only, not in Europe. Even today all languages in India for example Marathi-Punjabi are different; but it cannot be neglected that each language has a unique Indian style. Which language to be selected for writing is not the question of a writer but it is a question of the group in which the writer lives. Now, if one decides to write in French, only because one has studied French, what is its use? For whom and what will one write? J. M. Synge went to Paris to become a writer. There he met W. B. Yeats. Yeats advised him to return to his own land and write in his own language i.e. language of his people. J. M. Synge used the language of Aran land for his works. He is considered a great writer only because of his texts written in the language of people.

A great Kannada writer Kuvempu (Kuppali Venkatappagowda Puttappa), in his early period, used to write in English. When James H. Cousins, an Irish writer, visited India, Kuvempu showed his poems to Cousins. After careful reading, the first reaction of Cousins was 'what all this stuff is?' Kuvempu was surprised by this remark. He said that all his friends praised him; even the teachers encouraged him to write in English. Cousins said all that writing was good for Indians, but from the native speaker's point of view it was childish. Cousins advised Kuvempu to write in his own mother tongue i.e. Kannada. Kuvempu said that his language is not so strong and powerful, there are no strong words in the language to express the strong feelings. Cousins said that each language has its own strength. Once you use it you will realize its power and glory. Kuvempu's next doubt was how these thoughts could reach to the readers of the world, especially those who do not know Kannada. Cousins assured Kuvempu not to worry about that. People will translate it into English and the thoughts would reach to the world. Then onwards Kuvempu used Kannada i.e. language of his people for his writing. In an interview given in his later period Kuvempu reflected that he was wrong to say that his language is not strong to express the proper feelings. His mother tongue is rich and splendid; it bears the wealth of whole world in it [6].

Rabindranath Tagore, in 1913, (when he went to receive his Nobel Prize), was invited by Prof. J. E. Carpenter of Manchester College, Oxford to conduct religious prayer for the Indians living there. From the letter by Rabindranath Tagore it seems that Prof. Carpenter might have asked him to conduct the service in English. To this Rabindranath's answer was

very remarkable. It suggests Rabindranath's native attitude and love for mother tongue. In his letter written to Prof. Carpenter, Rabindranath writes[7],

37 Alfred Place
South Kensington
9 May 1913

Dear Dr Carpenter,

Many thanks for your kind invitation to stay at your house while I am at Oxford which I accept with great pleasure.

It is beyond my power to hold any divine service in English but if Bengali would suit my countrymen you can fix a time on Sunday 23rd.

Very sincerely yours
Rabindranath Tagore

In his next letter Rabindranath Tagore informed Prof. Carpenter that he would arrive there on 21st and depart after dinner on 22nd which clearly indicates that the Indians living there didn't like the idea of conducting a prayer in Bengali. Rabindranath Tagore was a true nativist. He wrote all his literature in Bengali and translated it into English. For him also the divine service is an act which is closely related to one's unconscious mind.

Though the language of all the groups in Maharashtra is Marathi, there remains a definite influence of sub language and sub culture. For example- though Nemade has not written in *Ahirani*, there is an impression of *Khandeshi* in his novels. Similarly, there is an impression of *Mandeshi* language in Madgulkar's writings. That is, though a novel is written in Marathi language there is a trace of Indianness in it. It cannot be forgotten that the novels written in Marathi-Bengali-Hindi-Punjabi-Tamil etc. belong to that languages respectively, still these are Indian novels. These languages have native Indian tradition. All literature in the world is identified by the name of the country in which it is produced. For example French literature, American literature, English literature, Australian literature, German literature, African literature etc. now German literature is produced in German language, French literature is produced in French language, English literature is produced in English language, Chinese literature is produced in Chinese language and Japanese literature in Japanese language. The literature written in Indian languages is Indian literature only; but due to various languages and due to the tradition of conflict of *Bhasha* literature against *Margi,* we call it Marathi-Bengali-Punjabi- etc literature. If any Indian writes in any native language or creates a work of art in any oral language it would be appropriate to consider and call it Indian literature.

Though there is great importance given to the language in nativism, it expects the language of huge group of people. The language of the high class that has been corrupted by the influence of Brahmo-English is not expected. As common men were unable to understand Sanskrit, Gautama Buddha used the language of people (*Pali*). But unfortunately that tradition is broken after Yadav period. As the Peshwa rule was completely of Brahmins, naturally there was a great influence of Sanskrit on Marathi. It widened the gap between Brahmins and non-Brahmins. The Marathiness of Mahanubhava and Saints was lost in Peshwa period only. Marathi had got the status of Brahmanized language. Consequently only Brahmin part was being reflected in literature. If by using Brahmin dialect, Brahmin-life is to be portrayed, then it doesn't matter if a Brahmin writer would write in his own language, as P. E. Sonkamble has picturised the Mahar life in his Mahari dialect. Various dialects got space in Marathi and made it rich and prosperous. Otherwise by being *Margi* it would have been ended. But unfortunately during the post-independence period all the Brahmins as well as non-Brahmins, started writing in the corrupted Brahminized Marathi. So the native form of original Marathi was lost. Jotirao Phule had proved that such Brahminized Marathi would never become the language of the mass. He raised voice against Brahminized Marathi and accepted Marathi which was being spoken by the common people. This awareness of Jotirao preserves the notion of native Marathi tradition. Jotirao deliberately made use of the language of Bahujan Samaj (masses); but later unfortunately the bahujan samaj also could not understand the importance of Phule's action. As bahujan samaj also started creating literature using Brahminized forms, the whole bahujan samaj went away from literature itself.

After their advent in India, Britishers started providing English education; but it was influenced by Macaulay's style of inverted pyramid. Naturally, first the Brahmins started acquiring English. Due to the end of Peshwa rule they had to worship Britishers. In this way they kept all educational system in their control only. So Marathi got the form of English-Sanskrit. As simple nature of Marathi ended, bahujans started calling Marathi a difficult language than English. Even today Marathi people consider Marathi a difficult language than English. In this regard V. R. Shinde writes about the effect of English on Marathi in his Diary[8],

Let me conclude by referring to my- perhaps a whimsical- opinion on a delicate issue. Nowadays, the so called Marathi language which we, the English educated people, speak and write, is incomprehensible to illiterate masses, particularly, people from rural area. The reason is though the words we employ are Marathi; our ideas are English and not as such understandable on elementary level. Pure Marathi existed from Jnaneshwar to Tukaram.

Moropant was the first to corrupt it. Gradually being corrupted, it sustained its life, somehow, up to Lokahitwadi and Jotiba Phule. But Chiplunkar suffocated it. Tilak and Haribhau Apate put last sips into its mouth; but that were proved last only. Today, we are copying English-Sanskrit exemplar of Chiplunkar covetously[9].

Very few writers became aware of the fact that this English-Sanskrit exemplar should not be copied into Marathi. All over Maharashtra, except Pune, people use dialects of Marathi for their routine communication. There remained no relation of Puneri dialect and literature with the rest of Maharashtra. The work of Little Magazine movement with reference to language is noteworthy. They tried to reduce the gap between spoken and written language. After Jotirao Phule's death, the Little Magazines made the language alive and progressive. That's why nativism appeared in literary criticism in post 1960s, accords an important place to the language of bahujan's in literature. The roots of these are found in the linguistic style of Jotirao Phule.

Approximately during the post 1960, new winds started blowing in literary field. These created a tendency in various castes and communities to ward off the monopoly of Brahmin language and literary culture. Through the movement of little Magazines a sub-movement namely Dalit literature emerged. Dalit stories, poetry, auto-biographies were confidently produced. Out of it emerged representative Indian poets like Namdev Dhasal. As the post 1960 generation threw away the literary signs of language, bahujan samaj acquired the confidence of writing. The Rural (*Gramin*) and Dalit literature created out of caste and language sensibility is the result of nativism. The noveslists like Bhau Padhye, Bhalchandra Nemade, Anant Kadam, etc. have deliberately accepted the native prose style and faced the social reality. The post 1960 literature basically shows its relation with the native tradition of Phule-Gandhi and Ambedkar.

Nativism advocates that everyone should write in his/her native language. It literally means one should not write in a foreign language. In Indian context this foreign language means English. In India such writing is published under the title Indian writing in English. Shantinath Desai has described such writing very ingeniously. He says[9],

> Thus Indian Writing in English could easily become a part of Anglo-Indian writing, then of English literature, then of Commonwealth literature, and of course it is always part of Indian literature- though marginal. An entity which can get into at least 4 circles- if one more circle is invented it would be a veritable Draupadi among literatures- with five husbands to cater to!

From this we can discern what is the condition of our English writing in the world? Instead of saying the Indians should not write in English, it can be said that it is impossible for Indians to do creative writing in English. Because one must have acquired mastery over the language in which one wants to write something creative, and it is hardly possible to acquire native like fluency over the foreign language. In this connection Nemade writes[10], "as the conceptual system that experiences are fixed similar to one's native language, it becomes necessary that the content of the writers who write in foreign language should be dissolved, because they lack the capacity to use the subsystem of a foreign language. So they can only create pseudo-prose of pseudo-poetry".

In Indian writing in English only the issue of creativity is important. Otherwise in the fields of science, technology etc., we don't have any other option than English. Previously this need was fulfilled by Sanskrit-Prakrit and Parsi. Next, after the advent of Britishers, due to their requirement, we had to learn English. While fulfilling their requirement we have not got any other lingua-franka than English. Due to the influence of English our native style is destroyed, along with it the aesthetic system also collapsed. Bhalchandra Nemade has stated reasons of this. He says, the roots of English are in foreign land. Its use in India as national language is often continued as cultural-written-formal, rather than social-oral-dialogicf[11].
Yet, this language is limited to the higher class only. It is not the language of bahujans, but Makarand Paranjape notes a different view. He says,

> English *is* the mother tongue of not just the Anglo-Indian "natives' of India (as Vasant Palashikar admits), but also certainly one of the mother tongues if not the only mother tongue of an increasing number of urban Indians, besides being, to use Probal Dasgupta's phrase, the 'auntie tongue" of a vast body of other Indians, whose number may be as large as the population of France. Surely, the language with this kind of following and with a history of nearly two hundred years of domestication cannot be dismissed so easily as "alien" or "foreign" [5].

To some extent Paranjape's view is right. If one's mother tongue is English, one is educated in English and whose environment is also English, then it is appropriate that he can write in English, but he has to make his way through native Indian English only. One should not try to fuse it with western culture. Otherwise the possibility of its becoming pseudo-literature cannot be denied.

An independent place has been allotted to English in multilingual environment of India. English is frequently used in the fields of science, technology and communication. It doesn't mean that all other native Indian languages are subordinate to English. English has

similar rights to that of other Indian languages regarding creative writing. But as an international language Indian writing in English is ridiculous and dreadful. Shantinath Desai gave an example of a collection *Ten Twentieth Century Indian Poets,* edited by R. Parthasarathi. In this collection the selection of the poets is made of those who write in English. The question emerges 'do the Indian poets write in English only?' the title of this collection misleads the foreign readers. Actually it should be *Ten Twentieth Century Indian Poets writing in English.*

An Indian writer experiences first in his / her own language, then translates it into other language. An Indian writer of international repute, Ashish Nandi says[12],

> "English is not my language. Though I have developed a taste for it, it was once forced upon me. Even now I often form my thoughts in my native Bengali and then translate when I have to put them down on paper".

It can be considered that all creative Indian writing in English is translation, because it slits the values of creativity. Throughout the world the writing in English, except in one's own language or mother tongue is considered translation because these writers are subconsciously translating the native language into English.

In English criticism nativism is used as a substitute term for *Desivad.* Even Nemade is also not an exception to this. If we want to translate *Desi Murgi* into English it is difficult because its translation as county hen, native chicken or country chicken would be inappropriate. In Indian contest *desi ghee* is always considered pure and of high quality. The quality of this *desi*ness cannot be translated into English. So it would be appropriate to use the word *desi* as it is.

Mahatma Gandhi's awareness about native language was extremely mature. That is why in his education plan the study of mother tongue is at the forefront. He also advocates that the medium of instruction should be the mother tongue. These views regarding creative writing and preservation of native language are quite appropriate. In Europe and America also many native languages have died. In England there exists no other language than English. Nativism strongly opposes this process of expulsion. Due to this our native language and native culture can be saved. It doesn't mean that we should not come on the global map. If the place of Indian literature is to be made firm on the world map, the translation of works from true native *Bhasha* literature is essential, not through Indian writing in English. We can acquire a place of honour in world literature by translating into English the works of Shivram Karanth, Shantinath Desai, Bhalchandra Nemade, Bhau Padhye, Namdev Dhasal, Narayan Surve, U. R. Anant Murthy etc. French and German writers have made their literature popular

in the world in this way only. They have not created something like French or German writing in English.

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अद्वैत वेदान्त : सामाजिक उपयुक्तता

अनंत भाऊराव बिडवे
श्रीमान भाऊसाहेब झाडबुके महाविघालय, बार्शी

सारांश

भारतीय तत्त्वज्ञान परंपरेचे अवलोकन करताना पुरातन काळातील आद्य शंकराचार्यांपासून ते ज्ञानदेवादि संतमालिके पर्यंत तसेच आधुनिक काळातील योगी अरविंद, स्वामी विवेकानंद, रामतीर्थ तसेच लोकमान्य टिळक, महात्मा गांधी व आचार्य विनोबा भावें पर्यंत सर्वांच्या उपदेशाचा, तत्त्वज्ञानाचा केंद्रबिंदू हा 'अद्वैत वेदान्त' आहे, ह्या निष्कर्षा प्रत आपण येऊन पोहचतो.

आठव्या शतकातील 'ब्रह्म सत्यं जगत् मिथ्या' ही आद्य शंकराचार्यांची घोषणा, बाराव्या शतकातील 'म्हणौनि जग असकी। वस्तु प्रभा। हा ज्ञानदेवांचा चिद्विलासवाद, सोळाव्या शतकात 'तुज मज नाही भेद। केला सहज विनोद।' अशी तुकारामांनी पांडुरंगासोबत केलेली सलगी, इ. बाबींचा विचार केला असता, या सर्वांच्या मूळाशी अद्वैत तत्त्वज्ञान आहे हे लक्षात येते. तसेच स्वातंत्र्यपूर्व काळात स्वामी विवेकानंदांनी संपूर्ण भारताला दिलेला अद्वैताचा संदेश, लोकमान्य टिळकांनी गीतारहस्यातून कर्मयोग सांगून ब्रिटीशांच्या विरोधात जागृत केलेले समाजमन, आसक्ती चा त्याग करुन अहिंसा व्रत आचरण्यास सांगणारा महात्मा गांधीजींचा 'अनासक्तियोग', 'ब्रह्म सत्यं जगत् स्फूर्ती' या अलौकिक घोषणेद्वारे आचार्य विनोबा भावेंनी यशस्वी करुन दाखविलेली 'भूदान चळवळ', या अशा सर्व घटनांचा संबंध अद्वैत तत्त्वज्ञानाशी कसा येतो ? याचे वर्णन प्रस्तूत संशोधन लेखामध्ये करण्यात आले आहे.

या सर्व विद्वानांच्या तत्त्वज्ञानाचे मूळ अद्वैत तत्त्वज्ञान आहे असे म्हणावे लागते. जो थोडाफार भेद जाणवतो तो तत्त्वज्ञानातील नसून मांडणीतील आहे. तत्कालीन परिस्थितीला अनुलक्षून व समाजातील आवश्यक बाबींचा विचार करुन तत्त्वज्ञानाची मांडणी केलेली असते, त्यामुळे असा भेद आपल्याला जाणवतो.

प्रस्तावना

भारतीय तत्त्वज्ञान परंपरंमध्ये आद्य शंकराचार्यांचा अद्वैत वेदान्त, रामानुजाचार्यांचा विशिष्टाद्वैतवाद, मध्वाचार्यांचा द्वैतवाद, वल्लभाचार्यांचा शुद्धाद्वैतवाद आणि निंबकाचार्यांचा द्वैताद्वैतवाद या सर्व सिद्धांतामध्ये अत्यंत प्रभावीपणे मांडलेला, अनन्यसाधारण असे महत्त्व असलेला आद्य शंकराचार्यांचा 'अद्वैत वेदान्त' या सर्व सिद्धांताचा मुकूटमणी समजला जातो. आद्य शंकराचार्यांचे परमगुरु श्री. गौडपादाचार्यांची 'मांडूक्य उपनिषद कारिका' अद्वैत वेदान्ताचा पाया मानली जाते.

शरीरभाष्य, पंचपादिका, बृहदारण्यभाष्यावरील वार्तिक, नैष्कर्म्यसिद्धी, भामती, संक्षेप-शारीरिक, खंडणमंडनखाद्य, पंचदशी, वेदान्तसार, वेदान्तपरिभाषा, सिद्धांत लेश, सिद्धांतबिंदू, अद्वैतसिद्धी व अद्वैतमोद, हे अद्वैत मत प्रतिपादन करणारे प्रमुख चौदा ग्रंथ मानले जातात.

भारतीय तत्त्वज्ञानाचा अभ्यास तीन प्रकारे झालेला आढळून येतो. पहिला प्रकार सांप्रदायिक पद्धतीचा, दुसरा प्रकार युरोपीय विद्वानांच्या पाऊलावर पाऊल ठेवणाऱ्या मुख्यत: मार्क्सवादावर विशेष भर देणाऱ्यांचा, तर तिसरा प्रकार बुद्धिवादाच्या व उपलब्ध पुराव्याच्या आधारे व काल्पनिकतेकडे न झुकणाऱ्यांचा होय. परंतु तत्त्वज्ञानाचा अभ्यास करताना संतानी मांडलेल्या आत्मोद्धाराची गरज तसेच

देशकाल परिस्थितीनुसार वस्तुनिष्ठपणे मानवी मूल्यांच्या जोपासनेकडे दिलेले विशेष लक्ष, संताच्या पाठीशी असलेले अनुभूतीचे शास्त्र अशा पुनरुज्जीवन वादी विचारांचा सखोल विचार व्हायला हवा. हा विचार करीत असताना संतांनी प्रतिपादलेली आत्मोद्धाराची गरज, मानवी मूल्यांची जोपासना, अनुभूतीचे शास्त्र या सर्वांना एक मूलभूत परिमाण आहे ते म्हणजे 'अद्वैत वेदान्त' होय. या अद्वैत तत्त्वज्ञानाचा विचार पुढीलप्रमाणे केलेला आढळून येतो.

आद्य शंकराचार्यांच्या ब्रह्मसूत्र भाष्यातील 'भावं तु बादरायणोऽस्ति हि '।। (ब्रह्मसूत्र - १/३/३३)[१] या सूत्रावरील भाष्यातून आठव्या शतकातील सामाजिक परिस्थितीचा अंदाज येतो. आचार्यांच्या काळात देवावरील श्रद्धा, निष्ठा ह्या डळमळीत झाल्या होत्या. सार्वभौम एकच राजा किंवा राजसत्ता नव्हती. राजसूय यज्ञाचे उदाहरण देवून आचार्यांनी वर्णाश्रमांचा अव्यवस्थितपणा व कोलमडलेली समाजव्यवस्था ह्या व अशा बाबींचे वर्णन केले आहे.

भ्रमित झालेले सामाजिक, धार्मिक जीवन, परस्परांचा द्वेष, मतमतांतराचा गलबला, आत्मोद्धाराचा विसर अशा परिस्थितीत आचार्यांनी अद्वैत वेदान्ताचे प्रतिपादन करुन सर्वांना एका सूत्रात बांधण्याचा प्रयत्न केला.

आचार्यांनी ब्रह्मालाच सत्य मानले व इतर सर्व स्थूल जगत मिथ्या[२] मानले. 'अखण्ड सच्चिदानन्द-मवाङ् मनसगोचरम्। आत्मानमखिला धारमाश्रयेऽभीष्ट सिद्धये'।।[३] हे ब्रह्माचे स्वरूप, तसेच भेद भासतात ते नामरूपामुळे व या भेदाचे कारण अविद्या आहे, ईश्वर सर्वज्ञ आहे, ब्रह्म हेच जगाचे कारण, ब्रह्म हे वृत्चैतन्य नसून साक्षिचैतन्य आहे, ब्रह्मभेदरहित आणि निर्गुण आहे, जग मिथ्या आहे, पंचकोश शरीर संकल्पना ज्ञानानेच मोक्षप्राप्ति इ. अशा सिद्धांतांची चर्चा आचार्यांनी आपल्या वेगवेगळ्या भाष्यांमध्ये केली आहे. तसेच साधनचतुष्ट्य, मायावाद, सत्तात्रयाचा सिद्धांत, परा विद्या आणि अपरा विद्या यां उपसिद्धांतांचे देखील विवेचन आचार्यांनी केले आहे. आचार्यांनी वरील प्रमाणे मांडलेले तत्त्वज्ञान अद्वैत सिद्धांत म्हणून ओळखले जाते.

ज्ञानदेवांनी ज्ञानेश्वरी, अमृतानुभव, हरिपाठ, चांगदेवपासष्टी, स्फुट अभंग इ. वाङ्मयातून अद्वैत तत्त्वज्ञान प्रतिपादित केले आहे. ऐशिया आपुलियाची सहजस्थिती। जया ब्रह्माची नित्यता असती।। (ज्ञानेश्वरी अ ८ ओ.१९), अगा ब्रह्म या नावा। अभिप्रावो मी पांडवा।। (ज्ञाने. अ.१४. ओ. ४०४) इ. ब्रह्म विषयी विचार तसेच म्हणोनि जग असकी। वस्तुप्रभा। (अमृतानुभव अ.७ ओ.२९०), जो आपणपेंचि आपणया। प्रकाशीतसे धनंजया।। (ज्ञाने. अ.१५ ओ. ५५६), जो प्रकाशेंवीण प्रकाशु। ईशितव्येंवीण ईशु।

(ज्ञाने. अ१५ ओ. ५४५) अशा प्रकारचा चिद्‌विलासवाद व सुवर्णाचे मणी केले। ते सोनियाचे सुती ओविले। तैसें म्या जग धरिलें। सबाह्याभ्यंतरी।। (ज्ञाने. अ.७ ओ.३२) हे पूर्णाद्वैती तत्त्वज्ञान ज्ञानदेवांनी प्रगट केले आहे.

ज्ञानदेव अद्वैती असूनही ते भक्तीचा पुरस्कार करतात. शंकराचार्यांनी देखिल भक्तीचा पुरस्कार करणारी अनेक स्तोत्रे रचिली आहेत. याबद्दल मुकुंद दातार म्हणतात "विशेष म्हणजे ज्ञानदेवांनी पुरस्कारिलेला भक्तिमार्ग अद्वैती आहे."[५] अशाचप्रकारे ज्ञानदेवांचे तत्त्वज्ञान अद्वैती आहे याबाबत मामासाहेब दांडेकर[६], शं.रा. तळघट्टी[७], गं.बा. सरदार यांचे विचार लक्षात घेणे आवश्यक आहे.

ज्ञानदेवांच्या अद्वैत तत्त्वज्ञानाच्या सामाजिक उपयुक्तेबद्दल गं.बा. सरदार म्हणतात, "समतेच्या व बंधुभावाच्या तत्त्वांचा पाठपुरावा करुन सामाजिक विषमतेची धार पुष्कळच कमी केली. सामाजिक प्रतिष्ठेपेक्षा, लौकिक मानमान्यतेपेक्षा वैयक्तिक चारित्र्य नि:संशय श्रेष्ठ आहे हे तत्त्व लोकांच्या मनावर बिंबविण्याचा त्यांनी प्रयत्न केला"[८] हे विधान लक्षात घेतले असता पारमार्थिक समता ही सामाजिक, राजकीय समतेची पहिली पायरी आहे, व ज्ञानदेवांना पारमार्थिक समता स्थलकाल परिस्थिती सापेक्ष योग्य वाटली यात संशय नाही.

ज्ञानदेवानंतर संत नामदेव, संत एकनाथ, समर्थ रामदास, संत तुकाराम इ. संतांनी तत्त्कालीन परिस्थितीला अनुरुप आपल्या अभंग वाङ्‌मयातून अद्वैत तत्त्वज्ञान नवनवीन रुपात मांडले व प्रसंगोपात त्याची सांगड मानवी मूल्य वृद्धिंगत करण्याकडे जोडली . आज ही आपल्या दिवसाची सुरुवात ज्ञानदेव तुकारामादि संतांच्या अभंगवाणीने होते. अभंगातील उच्च प्रेरणा व उच्च नीतिमूल्ये मानवाला आत्मोद्धाराच्या मार्गावर घेऊन जातात.

२१व्या शतकाकडे वाटचाल करणाऱ्या मानवाच्या इच्छा, आकांक्षा आणि गरजा विचारात घेऊन भारतीयांच्या उज्ज्वल भवितव्याची कामना मनात ठेवून स्वामी विवेकानंदांनी अद्वैत तत्त्वज्ञानाची मांडणी पुन्हा नव्याने केली. यामध्ये त्यांनी व्यक्ती, समाज, देव, देश आणि धर्म या सर्वांना केंद्रस्थानी मानले. अद्वैत वेदान्ताबद्दल लंडन येथे २२ आक्ये १८९६ ला दिलेल्या व्याख्यानात ते म्हणतात, "आधुनिक जगातील भौतिक आणि आध्यात्मिक संशोधनाशी मेळ बसू शकेल असा फक्त एकच धर्म आहे आणि तो म्हणजे अद्वैत वेदान्त"[९] वरील स्वामीजींचे उद्‌गार अद्वैत वेदान्ताची सामाजिक उपयुक्तता लक्षात येण्यास पुरेसे आहेत.

लोकमान्य टिळकांनी लिहलेल्या The Arctic Home In the Vedas, The Orion आणि गीतारहस्य या ग्रंथामध्ये गीतारहस्य हा अद्वैत तत्त्वज्ञान प्रतिपादन करणारा ग्रंथ आहे.

टिळकांनी गीतारहस्य हा ग्रंथ कर्मयोगाचे प्रतिपादन करण्यासाठी लिहलेला आहे. श्रीनिवास नारायण बनहट्टी यांनी टिळकांच्या तात्पर्याविषयी म्हटले आहे, "एकंदर अध्यात्मविषयांत टिळक हे शंकराचार्यांचेच पूर्ण अनुयायी आहेत. द्वैत, अद्वैत, विशिष्टाद्वैत व शुद्धाद्वैत असे जे वेदान्तात चार पंथ प्रचलित आहेत, त्यापैंकी टिळक हे पूर्णपणें अद्वैतमताला अनुसरणारे आहेत".[१०] थोडक्यात गीतेतील कर्मयोगाचे आचरण करुन लोकमान्यांना जे सामर्थ्य लाभले ते आपल्या देशवासियांना लाभावे व जीवनातील अज्ञान, मोह, भय, नष्ट होउन देशभक्तीची उत्कट प्रेरणा मिळावी हाच हेतू टिळकांचा गीतारहस्य लिहण्यापाठीमागे होता.

सर्व भारत देशाला परिचित असलेले 'भूदान आंदोलनाचे' सर्वेसर्वा, लोकभक्त, ऋषी, एक भक्त म्हणून विनोबा भावे प्रसिद्ध होते.

विनोबाजींची अद्वैत विचारसरणी अथवा सिद्धांताबाबतची सूक्ष्म दृष्टी त्यांच्या संपूर्ण वाङ्मयामध्ये उमटते. 'जय जगत', 'यत्र विश्वम भवति एकनीड्म', 'ब्रह्म सत्यं जगत् स्फूर्ती' या घोषणांद्वारे विनोबाजींनी लोकमत जागृत केले. विनोबांनी राजकारण + विज्ञान = सर्वनाश तसेच अध्यात्म + विज्ञान =सर्वोदय "[११] ही सर्वोदयाची संकल्पना मांडली. प्रा. नरहर कुरुंदकर विनोबांविषयी म्हणतात, "या अभ्यासाच्या खाणाखुणा त्यांच्या विवेचनात पसरलेल्या आहेत. विनोबा अद्वैती आहेत".[१२] विनोबांनी अद्वैत तत्त्वज्ञानाच्या माध्यमातून आपले विचार मांडले व लोकमत जागृत करुन भूदान आंदोलन यशस्वी करुन दाखविले. ५ आक्टोंबर १९५२ पर्यंत संपूर्ण भारतात ३.८०.१०८ एकर[१३] जमीन भूदान आंदोलनात मिळवून, त्यांनी ती भूमीहीनांना वाटली हे अद्वैत तत्त्वज्ञानाचा जीवनात अंगीकार केल्याची फलनिष्पत्तीच होय.

विस्तारभयास्तव प्रस्तूत संशोधन लेखामध्ये आद्य शंकराचार्य, संत ज्ञानदेव, स्वामी विवेकानंद, लोकमान्य टिळक व आचार्य विनोबा भावे यांच्या तत्त्वज्ञानात्मक पैलूंचा सारांशाने विचार मांडला आहे. या विविध पैलूंमध्ये आद्य शंकराचार्यांच्या अद्वैत तत्त्वज्ञानाचे प्रतिबिंब आपल्याला पाहावयास मिळते.

अद्वैत वेदान्त आणि त्याची सामाजिक उपयुक्तता याविषयी श्रीनिवास दिक्षीत, बी.आर. जोशी, र.ग. दांडेकर इ. अनेक विचारवंतानी मत व्यक्त केले आहे. र.ग. दांडेकर यांनी अद्वैताचा सामाजिक आशय स्पष्ट करताना एक महत्त्वाची बाब सांगितली, ते म्हणतात", येथे सारी ईश्वराची रुपे आहेत, कोणी उच्च नीच असा भेदभाव करणे शक्य नाही. हे महान तत्त्व अद्वैतमताने प्रस्थापित केले आहे. समानतेचे साम्राज्य स्थापन

होण्यास दुसरा मोठा आधार सापडणे कठीण. लोकशाहीमध्ये अभिप्रेत असलेल्या समानतेची संकल्पना अद्वैतमतानुसार स्वीकृत केली जाऊ शकते"[१४] ही बाब अद्वैत वेदान्ताची सामाजिक उपयुक्तता जास्त प्रकर्षाने मांडते.

पर्यावरण विषयक समस्या सोडविण्यासाठी अद्वैत तत्त्वज्ञान

उपनिषदांनी सांगितलेली **'ब्रह्मैवं विश्वंम समस्तमिदम्'** (मुंडक २/२/११)। ही अद्वैत विचाराची संकल्पना ज्ञानदेवादि संतानी जीवनाच्या प्रत्येक अंगामध्ये उतरविण्याचा प्रयत्न केला. ज्ञानदेवादि संतांच्या अद्वैत तत्त्वज्ञानातच आपल्याला आजच्या पर्यावरण विषयक प्रश्नांची उत्तरे मिळतात. 'यापरी माझां भावी। हें जीवसृष्टि आघवी ।। (ज्ञाने.अ.१०. ओ.९०), किंबहुना यापरी। निजप्रकृति अंगीकारी। आणि भूतसृष्टी एकसरी। प्रसवोंचि लागे।। (ज्ञाने. अ.९ ओ.११७) पृथ्विया भूतें वाहवीं। (ज्ञाने. अ.९ ओ.२८२), म्हणोनि भूतें हन सृजावी। कां सृजिली प्रतिपाळावी।। (ज्ञाने. अ. ९ ओ.१२१), जो खांडावया घावो घाली। का लावणी जयाने केली। दोघां एकची साऊली। वृक्षु दे जैसा।। (ज्ञाने. अ.१२ ओ.१९८), वसंत तेथ वनें। वन तेथ सुमनें। सुमनीं पालिंगने। सारंगाची।। (ज्ञाने. अ. १८ ओ. १६३५) तसेच हें विश्वचि माझे घर। ऐसी मती जयाची स्थिर। किंबहुना चराचर। आपण जाहला।। (ज्ञाने. अ. १२ ओ. २१३), इ. अनेक ओव्यांतून ज्ञानदेवांनी मांडलेल्या अद्वैत तत्त्वज्ञानातून पर्यावरण विषयक प्रश्नांची उत्तरे मिळतात. तसेच वृक्ष वल्ली आम्हां सोयरे वनचरे। पक्षी ही सुस्वरे आळवीती।। इ. अभंगातून तुकारामांनी पर्यावरण विषयक नीतिचा उपदेश केला आहे.

यच्चयावत् जीवसृष्टीत एकच 'ब्रह्म' तत्त्व आहे. ही ज्ञानदेवादि संतांनी सांगितलेली विचारधारा अंगिकारली, 'जीवातळी अंथरितु। आपुला जीव' या सद्भावनेने निसर्गातील प्रत्येक घटकाकडे पाहिले, तर आज निर्माण झालेली प्रदूषणाची समस्या, नष्ट होत चाललेली जंगले, संपत चाललेल्या पशुपक्ष्यांच्या जाती यामुळे पर्यावरणाला धोका होऊन संपूर्ण अन्नसाखळीच धोक्यात येण्याची शक्यता निर्माण झाली आहे. हा सगळा ऱ्हास थांबवावयाचा असेल तर ज्ञानदेवादि संतांनी दिलेल्या अद्वैत तत्त्वज्ञानाच्या दृष्टीतून आपल्याला पहाणे अपरिहार्य आहे.

निष्कर्ष

ज्ञानदेवादि संतांचे तसेच स्वामी विवेकानंद, लोकमान्य टिळक, आचार्य विनोबा भावे इ. विद्वानांच्या तत्त्वज्ञानाचे मूळ (base) हे 'अद्वैत वेदान्त' आहे ; या निष्कर्षाप्रत येऊन आपण पोहोचतो. तसेच हे तत्त्वज्ञान स्थलकालपरिस्थिती सापेक्ष सामाजिक, धार्मिक नीतिमूल्यांची जोपासना करण्यास उपयुक्त ठरली यात संशय नाही. याचे उत्तम उदाहरण म्हणजे आज भागवत धर्माची झालेली भरभराट व भागवत धर्माने आपल्याला

दिलेली सातत्यशील व सत्त्वशील परंपरा होय. म्हणूनच आपल्या तत्त्वज्ञानाचे मूळ हे अद्वैत वेदान्तात दडलेले आहे व तेच आपल्याला समाजभिमुख बनवू शकते हा निष्कर्ष योग्य वाटतो.

संदर्भ ग्रंथ

१. षट्शास्त्री हनुमानदासजी ब्रह्मसूत्रशांकरभाष्यम् पृष्ठ क्र.२७५ प्रकाशन, चौखम्बा विद्याभवन, वाराणसी, पुनर्मुद्रित संस्करण १९९८

२. ब्रह्म सत्यं जगन्मिथ्येत्येवंरूपो विनिश्चयः (आद्य शंकराचार्यकृत विवेक चूडामणि श्लो. २०)

३. जोग दत्तात्रेय वासुदेव श्रीमद्परमहंस परिवाज्रकाचार्य सदानंदप्रणित वेदान्तसार पृष्ठ क्र.२४ तृतीय आवृत्ती २००५ प्रकाशक मु.द. जोग डोंबिवली

४. एकोध्ययमात्मा नाममात्रभेदेन बहुधाभिधीयत इति। (ब्रह्मसूत्रशांकरभाष्य - १-४-४२)

५. दातार मुकुंद वारकरी संप्रदायाची प्रस्थानत्रयी पृष्ठ क्र.१२३ स्नेहल प्रकाशन पुणे प्रथमावृत्ती १४ जुलै २००८

६. दांडेकर शंकर वामन सार्थ ज्ञानेश्वरी प्रस्तावना प्रकाशक वारकरी शिक्षण संस्थ आळंदी देवाची अकरावी आवृत्ती १९९७

७. तळघट्टी शं.रा. ज्ञानेश्वरी विचार दर्शन

८. सरदार गंगाधर बाळकृष्ण संत वाङ्मयाची सामाजिक कलश्रुती पृष्ठ क्र.१२७ प्रकाशन लोक वाङ्मय गृह मुंबई चौथी आवृत्ती १९८२

९. स्वामी विवेकानंद ग्रंथावली खंड पाचवा पृष्ठ क्र.३२० पाचवी आवृत्ती प्रकाशन - रामकृष्ण मठ धंतोली नागपूर

१०. बनहट्टी श्रीनिवास नारायण लो. टिळकांची धर्मविषयक मतें निबंध पृष्ठ क्र. ११९ प्रकाशन वर्ष १९२५ प्रकाशक न.चि. केळकर टिळक स्मारक माला पुणे पुस्तक १ले

११. थत्ते यदुनाथ आमचे विनोबा संपादक राम शेवाळकर, पृष्ठ १८३ प्रथमावृत्ती ११ सप्टेंबर १९९८ मानसन्मान प्रकाशन पुणे

१२. कुरुंदकर नरहर आमचे विनोबा संपादक राम शेवाळकर, पृष्ठ २५४

१३. विनोबा भूदान आंदोलन परिशिष्ट - १ प्रकाशक अ.वा. सहस्त्रबुद्धे महाराष्ट्र सेवा संघ पुणे २, सन १९५२-५३

१४. दांडेकर र.ग. परामर्श खंड ११, अंक ४ नोव्हेंबर ८९ अद्वैताचा सामाजिक आशय एक टिपण पृष्ठ क्र. ४४४ प्रकाशन - परामर्श तत्त्वज्ञान विभाग पुणे विद्यापीठ पुणे फेब्रुवारी १९९०

वर्तमान हिंदी पत्रिकाओं की कविताओं मे आम आदमी

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विषय प्रवेश

हिंदी भाषा में प्रकाशित पत्रिकाओं की संख्या अनगिनत है। इन पत्रिकाओं में लिखनेवाले और कवियों की संख्या को निश्चित करना मुश्किल ही नहीं नामुमकिन भी है। पत्रिकाओं के साथ-साथ ब्लॉग तथा विभिन्न वेबसाईट पर कवियों की भरमार लगी है। अनेक विषय-आशय को लेकर अभिव्यक्ति की सफल-असफल प्रयास में हजारों कवि लगे हुए हैं। हिंदी भाषा में निकलनेवाली पत्रिकाओं में विषय वैविध्य दिखाई देता है। साधारणतः इन पत्रिकाओं में समीक्षा या आलोचना, कथा, कविता तथा आलेख ज्यादा प्रकाशित होते हैं। कुछ पत्रिकाओं में मात्र शोध-निबंध प्रकाशित किए जाते ह । जिन्हें 'शोध पत्रिका' कहा जाता है। कुछ पत्रिकाएँ हिंदी भाषा और साहित्य के प्रचार-प्रसार का काम करती हैं। इनमें से कुछ स्तरीय पत्रिकाओं को सरकार की ओर से अनुदान भी मिलता है।

वर्तमान हिंदी पत्रिकाओं में से कुछ महत्वपूर्ण पत्रिकाओं की चुनीहुई कविताओं को ध्यान में रखकर प्रस्तुत शोध-पत्र में आम आदमी की वर्तमान समस्या, पीड़ा, दुःख, यातना, कुंठा, अकेलापन, हीनभावना, आक्रोश, खीज, असंतोष और उत्तेजना को विवेचित किया है। हमने वर्तमान पत्रिकाओं में 'हंस', 'वागर्थ', 'तद्भव', 'समकालीन भारतीय साहित्य', 'आलोचना', 'कथादेश', 'सम्बोधन', 'नया ज्ञानोदय', 'अकार' तथा ' समीक्षा' पत्रिकाओं से कुछ कविताओं का लिया है। इन पत्रिकाओं द्वारा समय-समय पर प्रकाशित कविताओं को समकालीन आम आदमी की वर्तमान दशा का यथार्थ जीवन दर्शन होता है।

आम आदमी और वर्तमान कविता

वर्तमान कविता अपने युग और परिवेश से सम्पृक्त है। इस कविताओं में हम अपने वर्तमान को देख सकते हैं। हमारी आशा-निराशा, आकांक्षा-अपेक्षा, राग-बिराग, हर्ष-विषाद सब उसमें समाए हुए हैं। विकृत राजनीति, दुशवार होता जीवनयापन, सामाजिक विकृतियॉ, सिध्दांतों का खोकलापन सबको इन कविता में समेटा गया है। कुछ कविताएँ व्यंग और आक्रोश से भरी हुई है। स्वातंत्र्यौत्तर समाज की मोहभंग की अवस्था को इन कविताओं में अभिव्यक्ति मिली है।

कभी सांप्रदायीक कारणों से तो कभी जनता के विद्रोह के कारण लगातार बिगड़ते हालात को काबू पाने के लिए सरकार कर्फ्यू लगाती है। सांप्रदायीक दंगों से जन-सामान्य का खुशहाल जीवन नरक में तबदील हो जाता है। कुछ समाज विघातक शक्तियॉ धार्मिक झगड़े लगाकर हिंसा भडकाने लगती है। इस हिंसा में सामान्य लोगों को मौत के घाट उतार दिया जाता है। जीने की आस लिए कवि सामान्य मौत मरना चाहता है। कवि स्वाधीन भारत के लगातार बिगड़ते माहौल की ओर इशारा करते

हुए लिखता है- अगर रोज़ कर्फ्यू के दिन हों/तो कोई अपनी मौत नहीं मरेगा/कोई किसी को मार देगा/पर मैं स्वाभाविक मौत मरने तक/जिंदा रहना चाहता हूँ। [1]

विषमता की खाई दिन-ब दिन गहरी होती जा रही है। जिस देश में विश्व के सबसे अमीर लोग रहते हैं उसी देश में गरीबी रेखा के नीचे तीस प्रतिशत जनता रहती है। विरासत के रूप में मिली संपत्ति से एक तबका अरबों-खरबों में खेल रहा है तो दूसरा दो-कौर रोटी को मोहताज़ है। इन गरीब देशवासियों के जीवन में चॉद की सुंदरता और सॉसों की शीतलता कहॉ। -विषमता की बर्बरता/इतनी विकराल है/ देह के समुद्र में/कष्ट के टेढ़े चॉद की नोके/ चुभती है/ हड्डियों में कीलों सी गड़ती हैं/ सांसो की लहरें/ थरथराती रहती हैं। [2]

आदिवासी समाज को मानव होकर भी जानवरों के समान जीना पड़ता है। जंगल में रहनेवाले इन उपेक्षित समाज के पास न खाने के लिए रोटी का टुकडा होता है न पहनने के लिए फटा चिथड़ा। उनका इतिहास छोडिए उनके पास बताने के लिए पूर्वजों के किस्से भी नहीं है। इन आदिवासियों को विरासत में दुःख और एक तीर-कामठी मिल जाती है। उन्हें इतना ही पता होता है कि वे इस जंगल का हिस्सा है। इनके नामपर संसद में हंगामा होता है, पैकेजों की घोषणा की जाती है लेकिन दुर्भाग्य से एक सुविधा उसके पास पहुँचती हो ? 'दुरसिंग का फल्या' कविता में आदिवासी समाज की वर्तमान भयावह अवस्था की ओर कवि प्रदीप जिलवाने संकेत करते हुए लिखते हैं -देह के पिंजर को/मामूली चिंदे से ढ़क बच्चे/पीटते हैं बरतन/ बजाते हैं पेट/ डराते हैं भूख को। [3]

अस्तीत्वबोध से गुजरता आम आदमी हाशिये पर चले जाने का दुःख सीने में लेकर जीता है। वर्तमान भागदौड़ भरे जीवन में नेता, अभिनेता तथा उद्योगपति की चकाचौंध पर सभी की नज़र है। सामान्य आदमी का जैसे कोई वजुद ही नहीं है। उसकी भी कुछ ख्वाईशें हैं, उसे भी लगता है कि कोई उसे पुकारकर उसके अस्तित्व का सबूत दें।कवि कहता है- मेरा भी एक नाम था/ हालांकि न जाने कब से मुझे पुकारा नहीं गया। [4]

महानगरीय सामान्य जन का जीवन तनावग्रस्त, थकावटभरा हो गया है। मशीनी कार्यव्यस्तता से छुटकारा पाने के लिए आदमी बाहरी उपाय ढूँढता है। निरंतर चाय और सिगरेट के सेवन ने शरीर को खोखला और रोगग्रस्त बना दिया है। कहॉ गॉव के सुदृढ़ शरीर के तंदुरूस्त युवक और कहॉ छाती के पिंजर बने शहरी नौजवान ? कवि अपने ही शरीर से माफी मॉगता है। उसे दुःख है कि वह अपने शरीर का शोषण कर रहा है। दिन भर बाईकपर घूमना, ऑफिस, घर के काम, पल भर शरीर को विश्राम नहीं। कवि अपने शरीर कहता है-तुम्हारे न चाहते हुए भी दोस्त के साथ चाय/साथ-साथ सिगरेट भी पी लेता हूँ/तुम बताते हो खीजते हो, सीने में जलन को लेकर/और मैं लौटते हुए तुम्हें कितना थका डालता हूँ। [5]

समस्या, तनाव, घुटन में जीने पर भी आम-आदमी हॅसता रहता है। मुसिबतों से भरा जीवन सुखावह बनाने की कोशिश करता है। वह हॅसता है मतलब वह सुखी है कि धारणा कितनी गलत होती है। उसके अंदर झॉककर देखें तो पता चलता हैं कि वह अनगिनत जख्मों से घायल है। - ऊपर हॅसने वालों के भीतर भी/ अनगिनत जख़्म पुराने निकले। [6]

शहरी बुजुर्ग आम-आदमी की हालत तो अत्यंत शोचनीय बन गयी है। पिता-पुत्र एक ही शहर में रहते हुए भी अलग-अलग मकानों में रह रहे हैं। संयुक्त परिवार के बिखर जाने के बाद मानवी रिश्तों की आत्मीयता ही गायब हो गयी है। सुख-दुःख को बॉटने के लिए अपना कोई तो पास हो ? पर वक्त किसें है ? कोई किसी के जीवन में दखलंदाजी नहीं करता। अजनबियों से समान मिलना होता है। सुख ना सही। अपनों ने दिया दुःख भी जीवन में रस घोलता है। बालक कितना सताता है मॉ को थोड़े ही पीड़ा होती है ? बालक से सुकुन तो नहीं लेकिन दर्द भी न मिलने का दुःख माता को है – एक ही शहर में रहते हुए माता-पिता/ बूढ़े होते रहते हैं/ और याद करते रहते हैं कि उन्होंने/ पैदा किया था एक बेटा/जो सुख क्या दुख भी नहीं/ देता है उन्हें। [7]

महानगरीय जन अतृप्ति और अधुरेपन की भावना से ग्रस्त है। सुख की परिभाषाऍ ही बदल गयी है। सुविधा में सुख ढूॅढ़ने की होड़ में आदमी और दुःखी हो जाता है। उससे दूसरे का सुख देखा नहीं जाता। दूसरे का मकान, बच्चे, पत्नी, यहॉ तक की कमीज़ भी दूसरे की ही अच्छी लगती है। इस बेतुकी तुलना में अपने पास जो मूल्यवान है उसे भी वह खो देता है। – तुलनाऍ आदमी को देने लगती हैं/ दुख/ जो कुछ उनके पास बचा हुआ है/ मूल्यवान, उस तरफ नहीं जाती/ उनकी निगाह। [8]

भूमंडलीकरण के दबाव से व्यापारिकरण बढ़ गया। चीजों को बेचने की होड़ सी लग गयी। व्यापारी मनोवृत्ति की उपज़ से निकले कारोबार में गंगा के पानी को बोतल में बंद करके बेचा जाने लगा। दूकानदार समाज की भावनाओं को भुनाने में लग गए। विज्ञान की तरक्की कुछ समूहों के पास तक ही सिमित रही। आम-आदमी, गरीब, आदिवासी, किसान, भूखा उस तरक्की से कोसों दूर था। तद्भव में प्रकाशित अरविंद की 'धोखा भी एक हत्या है' कविता में कवि समाज के साथ हुए धोके का जिक्र करते हुए लिखते हैं – दो वर्ष के समय की लम्बाई का पता लग सकता था/ दो दिन की भूख की लम्बाई का पता नहीं लग सकता था। [9]

आत्महत्या करते किसानों के प्रति वर्तमान कविता चुप कैसे रह सकती थी। सारी मानवजाति के पालनकर्ता कर्ज, अपमान, अवहेलना से तंग आकर गले में फॅदा डाल रहे हैं। उसे परिवार की परवरिश में खरा न उतरने का बॉझपन सताता है तो दूसरी ओर प्रकृति का खेल। कभी सूखे के कारण तो कभी बाढ़ के कारण फसल बरबाद होती है। फसल के हवाले से लिया कर्ज अदा न करने पर साहुकार बेइज्जती पर उतर आता है। स्वाभिमानी किसान मानहानी से अच्छा मर जाना पसंद करता है। किसान के चले जाते ही सारा परिवार बिखर जाता है- न मिला सहारा हमें, न किसी को रहम आया,/ न

लाला ने, न फौजी चाचा ने तरस खाया।/ बाब्बू ने डाल लिया फंदा गले में, छा गया मातम,/ मॉ, भाई और बहन ने भी आखिर तोड़ दिया दम। [10]

स्त्री चित्रण और वर्तमान कविता

कवि आम-औरत का चित्रण करते हुए नर्मदा के विस्थापित परिवार के पुर्नवास के लिए लडनेवाली कुंता बेन और नक्सलवाद से प्रभावित इलाके की पुत्रशोक से पीड़ित चिन्ना मटासी की मॉ के दुख को वाणी देने का काम करते हैं। इतिहास के पन्नों को पलट कर देखें तो पता चलता है कि नर्मदा की लड़ाई औरतों ने ही जी जान से लडी। स्त्री अपना घरबार-परिवार उजडते नहीं देख सकती। बाद में इनमें से अनेक स्त्रियों को गुमनामी का जीवन ही नशीब आया। कुंता बेन को कवि कहते है- बांध तो बन गया कुंता बेन/ तुम सब के सामूहिक दुःस्वप्नों से भी बहुत ऊंचा/ अब तुम कहां हो कुंता बेन ? [11]

आज का कवि मॉ के व्यक्तित्व की पूजा करता है। उसे मालुम है उसके लिए मॉ ने कितना बड़ा त्याग किया है। परिवार के सभी सदस्यों को खुश रखकर उनके सुख में सुख देखनेवाली मॉ कवि को त्याग की प्रतिमूर्ति लगती है।– मुझे लगता है/ न और हॉ/ ज़ोड कर बनी है मॉ/ अपने लिए ना/ अपनों के वास्ते हॉ.....[12]

कहा जाता है माता-पिता के प्रेम को जानने के लिए माता-पिता बनना पड़ता है। पिता की जिम्मेवारियों का पता पिता बनने के बाद ही चलता है। बचपन में पिता जब गुस्सा करते हैं तो उनके प्रति क्रोध उत्पन्न होता है। पिता शेर की तरह दहाड़ते है और माता शेरनी की तरह प्यार करती, दुलारती, पुचकारती है। बिना मॉ के बच्चों के पिता, माता की भूमिका अदा करते हैं। किसी कारणवश कवि उनसे विद्रोह पर उतर आता है तो वे मुस्करा कर विद्रोह को माफ करते हैं। जब कवि खुद पिता हुए तो उन्हें पता चला–पिता बरगद हैं/पिता पहाड़ हैं/पिता नदी होते हैं/ पिता झरने होते हैं। [13]

समाज शिक्षित हो जाने के बाद भी औरत का शोषण कम नहीं हुआ है। औरत घुट-घुट कर जीने को अभिशप्त है। 'एक औरत' कविता में सुनीता जोशी कहती है-एक औरत जो अपने जिंदा रहने की मजबूरियों का/हिसाब-किताब रखते हुए गिनती रहती है अपनी सॉसे। [14] औरत को औरत के रूप में देखों जानवर के नहीं बस इतना तो वह चाहती है - उस औरत ने/ तीसरी बार पूछा-/'मुझे पहचानते हो ?'/ अबकी मंच की ओर से/ उत्तर आया-/ 'हां तुम औरत हो'/ उस औरत ने कहा–/'खुदा का शुक्र है!'/इंसानियत अभी जिंदा है। [15] आलोचना के अंक में श्यामपलट पाण्डे की कविता 'वह औरत नहीं है' में नारी के वर्तमान हालत से हम रूबरू हो जाते हैं। वह लिखते हैं -वह औरत नहीं/ एक ठहरी हुई नदी है/ जो कब का भूल चुकी है/ मुस्करान/ ठिठोली करना/ गुनगुनाना/ और एक बहती नदी की तरह/ प्यार करना। [16]

निष्कर्ष

वर्तमान कुछ हिंदी पत्रिकाओं में प्रकाशित हिंदी कविताओं के अध्ययन से ज्ञात होता है कि इन कविताओं में आम-आदमी की वर्तमान दशा का लेखाजोखा प्रस्तुत किया गया है। आर्थिक विषमता, मानवी संबंधों का खोकलापन, घुटन, टूटते रिश्ते की कडुवाहट, अकेलापन, निराशा, तनावग्रस्त जीवन जीते महानगरीय लोग, आत्मीयता को खोजता आम आदमी, शोषित परंतु अपनों के लिए त्याग करनेवाली नारी, अपने शोषण को पहचानकर जीने की राह खोजने निकली औरत और सरकार की गलत नीति का शिकार किसान। कवि आम आदमी के सभी पहलुओं पर प्रकाश डालकर उनकी परेशानी, संघर्ष को चित्रित करता हैं। वर्तमान हिंदी पत्रिकाओं में प्रकाशित कविताओं में विषय की विविधता दिखाई देती है। किसी एक वाद या घेरे से ये कवि और कविताएँ बचती है। वर्तमान पत्रिकाओं ने अपने साहित्य द्वारा समाज और आम आदमी के प्रश्नों और समस्याओं का तो ध्यान रखा ही है साथ में जीवन को सुंदर और समृध्द बनाने में योगदान दिया है।

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A STUDY OF KUVEMPU'S NOVELS

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Kuvempu is quite a prolific writer. He has enriched 'Navodaya' Kannada Literature, it is to his credit that both by Volume and Values. The Kannada Literature has gained much. As a poet and Novelist he is one of the most reputed men of letters in Kannada. He has also tried his hand at criticism and has emerged as one of the best aesthetic, critics.

He has produced only two novels- 'Kanuru Heggadati' and 'Malegalalli Madumagalu' but these two novels occupy very important place in the history of Kannada novels, especially the novels dealing with a particular region or a province.

'Kanuru Haggadati' was published in 1936. The novel gives vivid and beautiful pictures of the 'Malenad' with its rich natural beauty and the life of the people inhabiting in this corner of dense forest. The novel deals mainly with the life of 'Chandrayya Gouda', the Heggades of Kanur, and how his lustful epicurean life, pride and cruelty and marooning indeedness gradually leads to the decline and down fall of Heggadys. Kuvempur seems to be at his best when he narrates all the characters. And these characters Hoovayya, Ganga, Subbamma, Saragara, Venkappayya, Singappa Gouda, etc are related to Chandrayya Gouda in one way or the other. Chandrayya Gouda becomes the pivotal point, around which all the characters go.

We see here Chandrayya Gouda, all through the vicissitudes of life, on the contrast Hovayya is an idealist.

With Chandrayya Gouda's lustful licenses life, prostitution of Ganga, tracherous and deceitful life of Saragara, selfless and dedicated life of Sita, we see here the various faces of life confronting each other, and there by presenting the whole life of the people with all its complexity.

Kuvempu has not only touched the outword life of the Malenadigas', but he goes deeper into their lives and recreates in his novel the cultural aspect of their life pregnant with rich tradition and heritage, hopes and aspirations, rites and rituals etc. Moreover, an ardent lover of nature as he is, he never looses an opportunity to probe deeper into the misty of nature, which however forms the part and parcel of Malanadigas life, with the evergreen mountain ranges, skyscraping trees, the rainbow glory scenes of rainy season, the variegated life of animals and birds, the hunting spree etc all these animate and inanimate

things have been unified with the life of the people there. This has helped to raise the novel above artificiality.

'Malegalalli Madumagalu' was published in 1967. Though this has been published after 'Kanuru Haggadati', the story it deals with is much older than that of 'Kanuru Haggadati'. It deals with the life of a people, which has not even dreamt of civilization. The elopement and marriage of law born 'Nai Gutti' with his ladylove 'Timmi' becomes an ideal to 'Mukundayya', a man belonging to upper class. That is the reason why he too runaway with Chinnamma from the marriage hall and wanders in the dense forest of Malanad. This effort to "save and escape" becomes an important incident and action. Gutti saves himself and Timmi, Mukundayya saves Chinnamma, and also Devayya from conversion. In this way the novel proceeds with this action of' saving and protecting.

Complementary to this, Bharamayya Heggady's pride, Devayya's dendical life, Mukundayya's idealism, Aita-peechalu's co-operative attitude, Nagakk's compassionate art, Gutti and Timmis frankness, cheenkra's ingratitude, Jeevaratnayya's conversion plot, Sabu's tricky and cheating mentality, Hulya-the dog's – fidelity, Reverend Lakshill's humanity – all these have become Warf's and wove of the novel, and has given it the required complexity and multidimensional aspects and have become quite significant in instilling the novel with rich experience.

Thus both the novels have been quite successful. Kanuru Heggadati is wall structured from the viewpoint of plot and Malegalalli Madumagalu is rich. It gives a vivid picturesque life of the Malenadiga's.

The harmony and disharmony, hopes and disappointment, deeds and wrongs, pride and oppression deception and treachery, pain and agony, sweetness and bitterness these all form the very essence of their life here, were as though even haste is finding the slowness. So every thing here has been delineated to be moving naturally and unassumingly. The re-creation of the life with brimming vitality and essence can be said to be the source of the success of the Novel.

Both from the viewpoint of the period of publication and their magnitude, they occupy very important place in the history of Kannada novels. Further from the viewpoint of the waste and variegated life that the novelist brings into the framework of his canvas, these novels may be termed epic novels ranking with the greatest novels of the world such as 'War and Peace', 'Los miserables' etc.

Of late a number of novelists have enriched the Kannada literature with their various types of novels-social, historical, psychological and regional novels, broadly outlining the

characteristic qualities of such novels and tracing the characteristics of Regional novel in general. Any one can make a study of Kuvampu's novels tracing there place in particular in the realm of Kannada Regional Novels.

I think the novels can be studied from the following view points.

1. As a Regional Novel
2. As an Epic Novel
3. Novel as an art
4. Psychological analysis of the characters
5. Social life of the people in the novel
6. Analysis of the cultural life
7. Use of language
8. The philosophy of Kuvampu as propounded in the novels
9. The place of Kuvempu as a novelist

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MEASUREMENT OF EMOTIONAL INTELLIGENCE

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Abstract

Intelligence is the God Gift to every human being. Everybody has specific intelligence by birth. It can be measured using different intelligence tests. The Intelligence quotient i.e. I. Q. used to be the main factor in deciding and developing curriculums of different courses; and also in the promotions in any field. Up to 1990, it used to be considered as predictor of a person's success in Education, Professional and Social life. But in 1990, Peter Salovey & John Mayer, stated the concept of Emotional Intelligence, for the first time. But the concept was popularized by Daniel Goleman. He found through a survey about success of millionaires from U. S. A. that the important components of success are honesty, discipline, social communication, good life-partner & efforts. These five components are related to Emotional Intelligence & not to cognitive intelligence. This showed that, though I. Q. used to be the important factor in success of a person, all the persons with high I. Q. are not successful in their life. On the contrary, the successful persons are mostly with low I. Q. but with comparatively higher Emotional Intelligence. Emotional Intelligence is concerned with the proper use of emotions in an intellectual way. Emotions are part & parcel of one's life but are the decision factors of one's life in adolescence stage. This paper has attempted to measure emotional intelligence of ninth standard students. For the same, the researcher has developed an emotional intelligence test, consisting of 109 statements. This test had been administered on 766 students of ninth standard from 15 government granted schools in Solapur city. The data collected were analyzed to determine the reliability & validity of the test using split half method. The coefficient of correlation was a major statistical technique used for this. The reliability of the test found to be high with its coefficient. 0.85 and the validity of test is good with its coefficient 0.63. This test is useful to measure emotional intelligence of ninth standard students and hence is helpful to improve the emotional intelligence of students with lower emotional intelligence.

Introduction

Our life is full of problems such as educational, professional, religious etc. In other words, our life has many stormy periods. Adolescent stage of a human being is also a stormy period. In this period many physical as well as emotional changes take place which results into the development of specific views, attitudes which remain so throughout life. So this period has educational value in order to identify, regulate, manage & express the emotions of everybody. All this concerns with emotional intelligence and hence, efforts should be made to develop it. For the same, the researcher needed to know the standard level of emotional intelligence of ninth standard students, emotional intelligence of a particular student. Hence, the researcher has developed an emotional intelligence test for ninth standard students.

This research is useful for ninth standard students, their parents, teachers, headmasters of their schools to measure emotional intelligence of ninth standard students. Also, the test is useful to counselors for career guidance.

In this perspective, the researcher has attempted to develop an emotional intelligence test and to determine its reliability and validity.

Method

The determination of the reliability and validity of the emotional intelligence test, developed by the researcher, was related with the present status. To determine these factors, the responses to the emotional intelligence test by the students, were collected through survey from the description research method.

Sample

In this research, all the secondary schools of Marathi medium in Solapur City, which are granted by the government of Maharashtra state, were considered. All the ninth standard students from these schools were considered for the study. For the data collection, 15 divisions of ninth standard from 15 Schools, granted by government of Maharahstra, were selected by systemic random sampling method. From these 15 divisions, 766 students of ninth standard had given responses to the test.

Tool

The study was concerned only with the emotional intelligence of the ninth standard students. In this study, the researcher has developed an emotional intelligence test for ninth standard students. The test has 109 statements showing positive and negative behaviour with respect to five components of emotional intelligence such as self awareness, self regulation, motivation, empathy and social skills. The distribution of these 109 statements according to the five components of emotional intelligence is shown in the following table.

Table 1. Emotional Intelligence Test: Componentwise Distribution of Statements

Sr. No.	Component of Emotional Intelligence	No. of Positive Statements	No. of Negative Statements	Total No. of Statements
1.	Self Awareness	12	11	23
2.	Self Regulation	9	15	24
3.	Motivation	10	9	19
4.	Empathy	14	8	22
5.	Social Skills	10	11	23
	Total	**55**	**54**	**109**

The five alternatives of responses to these statements were as follows.

(1) Always (2) Many times (3) Sometimes (4) Very few times (5) Never.

To give the response to these statements, only one of the alternatives was to be selected. These responses were evaluated using the following key.

Table 2. Emotional Intelligence Test : Evaluation of Responses

Statement	Always	Many times	Some times	Very few times	Never
Positive	5	4	3	2	1
Negative	1	2	3	4	5

Statistical Techniques

To determine the reliability and validity of the emotional intelligence test, developed by the researcher, mean, standard deviation and correlation coefficient from descriptive statistics were selected and used.

(A) Reliability of Emotional Intelligence Test

To determine the reliability of the emotional intelligence test, the researcher has used split half method. For this, one group of odd numbered statements (i. e., 1, 3, 5, 7,...) and another group of even numbered statements (i. e., 2, 4, 6, 8,…) were formed. Due to splitting, the length of the test became half. So, coefficient of correlation of these two groups is the coefficient of reliability of the test is 0.8558 using Spearman- Brown formula.

(B) Validity of Emotional Intelligence Test

The researcher has determined the content validity of the test using the views given by the experts and the observations of the pilot study.

To determine the validity coefficient of the test, the correlation coefficient of scores of Self Awareness i. e. first component of Emotional Intelligence test & the scores of the complete test was calculated. The coefficient of validity of the test was 0.6321.

Conclusions

The conclusions of this research are as follows.

(1) The coefficient of reliability of emotional intelligence test is 0.8558.

(2) As per the inference table of correlation coefficient, the reliability of emotional intelligence test is high.

(3) The coefficient of validity of emotional intelligence test is 0.6321.

(4) As per the inference table of correlation coefficient, the validity of emotional intelligence test is good.

Contribution to the field of Education

The emotional intelligence test developed by the researcher in this study is useful to measure the emotional intelligence of ninth standard students. Using these scores, the headmasters of the schools, teachers, their parents, and counselors can identify the students with lower emotional intelligence and hence can develop and implement necessary programmes to improve the same.

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