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IN-VITRO MORPHOGENIC RESPONSE OF *IXORA PARVIFLORA* VAHL.

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KEY WORDS
callus, bud culture,
node culture, root- proliferation,
Rubiaceae
ABBREVIATIONS
2, 4-D - 2, 4- dichloro-
phenoxy acetic acid,
KIN – 6-furfuryl amino purine
(kinetin),
MS -Murashige and Skoog,
NAA – α -naphthaleneacetic acid
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ABSTRACT

Ixora parviflora Vahl. is an ornamental shrub which is used in whooping cough and anaemia. Its tissue culture study was undertaken to search out morphogenic responses of explants taken from different parts of the plant. 6-furfuryl amino purine (KIN) with α-naphthalene acetic acid (NAA) produced normal growth in the cultured shoot apex. Shoot apex, leaf, internode and node explants were found suitable for callus production. Murashige and Skoog medium with KIN and NAA induced normal growth in cultured floral bud. Internode was found most suitable for production of roots when cultured on NAA (1.5 mg/ L).

INTRODUCTION

The genus Ixora (Rubiaceae) comprises 160 species out of which 30 are found in India. Ixora parviflora Vahl. is one of the Indian species. It is a shrub cultivated in gardens for its beautiful white crown of flowers and evergreen leaves. Its flower is used in whooping cough and decoction of bark is used in anaemia (Santapan and Henry, 1973, Thacker et al., 1959). Its propagation through cuttings takes about six months in rooting. Thus, conventional method of propagation is time consuming and labour intensive. Micropropagation method through tissue culture has not been exploited and there has been no report of any tissue culture studies of *I. parviflora.* However, micropropagation has been reported in two other species, *Ixora coccinea* (Lakshmanan et al., 1997) and *Ixora singaporensis* (Malathy and Pai, 1998). The objective of the present work was to investigate *in-vitro* morphogenic response of different parts of *I. parviflora* to establish foundation for biotechnological study and micropropagation of this important plant.

MATERIALS AND METHODS

Shoot apex, leaf, node, internode and floral bud, all in their early stage of development, were taken as explants. These explants were washed with 0.1% (v/v) Tween 80 for 30 min. After washing they were surface sterilized with 0.2% (w/v) $HgCl_2$ for 8 min and finally rinsed with sterile distilled water 3-4 times. About 1-1.5 cm segments of these explants and whole floral bud were dried on sterile filter paper and cultured on Murashige and Skoog (MS 1962) medium with 30g / L sucrose and 8g /L agar, KIN, NAA and 2,4-D (Hi-media, Bombay) at pH 5.6 (Table 1). The cultures were grown under 24-h

photoperiod with florescent light at 26± 2ºC. Calluses produced were subcultured on previously described media under similar physical condition. Ten replicates were maintained for each treatment. The cultures were evaluated after six weeks for morphogenic responses.

RESULTS AND DISCUSSION

Establishment of explant

Very high rate of contamination and browning of medium due to phenolics exedution were observed in all the explants during establishment to the culture medium. However, leaf and floral bud explants exeduded less phenolics. Both the problems were solved by repeated subculturing of the explants and surface sterilization methods described earlier.

Success of tissue culture experiments is highly dependent on surface sterilization of the explants (Cramer, 1994). Process of surface sterilization is specific to species; same process does not work for different sources of explants even of the same species. Phenolics present inside explants gradually exhaust on repeated subculturing and thus help in establishment of the explants to the culture medium.

Shoot apex culture

Lower concentration of KIN and NAA induced normal growth in shoot apex without callus formation. However, increase in the concentration of KIN to 2.0-3.0 mg/ L induced callus formation and restricted normal growth of shoot apex (Table 1). Similar to our finding Malathy and Pai (1998) reported that higher concentration of cytokinin restricts growths of shoots in *I. singaporensis.* The reason for non proliferation of axillary shoots might be the strong apical dominance as observed in *I. coccinea* (Lakshmanan et al., 1997) and *I. singaporensis* (Malathy and Pai, 1998).

Apical dominance is caused by the action of basipetally transported auxin from the apex and the consequent inhibiting of axillary bud growth (Clime, 1994).

Leaf culture

Lower concentration of KIN and NAA favoured callus formation in cultured leaf explants from their cut ends especially at the regions of mid-veins and veinlets. As found in the present work, Panda et al. (1991) also found cut ends of leaf responsive for callusing. Combination of cytokinin and auxin in the media are known to give better response than only auxin as reported in *Sideritus* (Sanches-Gras and Segura, 1997).

Node culture

2, 4-D with KIN favoured development of callus in case of node culture (Table 1). Similar to our finding it was reported that for callus formation, 2, 4-D is the most potent auxin (Zagorska et al., 1997). It strongly antagonises organised development.

Internode culture

NAA alone was found suitable for proliferation of roots from internode (Table 1). Best rhizogenesis from internode was achieved when cultured on medium with 1.5 mg/ L NAA (Figure 1). Similar to our finding, Lakshmanan et al. (1997) reported NAA to be the most effective auxin for initiation and growth of root in *I. coccinea*.

Floral bud culture

KIN together with NAA induced growth in floral bud and produced normal flower (Figure 2). However, Lakshmanan et al. (1997) reported requirement of another cytokinin (BA) for production of normal flowers in *I. coccinea.*

We found that different explants responded differently on the culture medium. The

variation in responses of explants may be attributed to altered levels of endogenous hormones, variation in degree of differentiation and finally their response to exogenous hormones present in the medium (Sudha Vani and Reddy, 1996).

In order to develop micropropagation protocol we undertook tissue culture study of different parts of *I. parviflora*. Findings of the study as reported by us will make foundation for future biotechnological studies.

Table 1. *In-vitro* response of *Ixora parviflora* cultured on MS (1962) medium

MS medium supplemented with growth hormones (Mg/L)	Cultured Explant	% of Cultures producing callus	Cultures producing roots		Other response
			No. of roots produced per explant	Length (cm) of roots	
KIN (0.5-1.0)+NAA(1.0-2.0)	Shoot apex	-	-	-	NG
KIN(2.0-3.0)+NAA(1.0-2.0)	Shoot apex	86.6	-	-	-
KIN(0.5-3.0)+NAA(0.5-2.0)	Leaf	70.7	-	-	-
KIN(0.0)+NAA(0.5)	Internode	25.0	2.0±0.7	1.5±0.2	-
KIN (0.0) + NAA (1.0)	Internode	32.0	2.5±0.6	2.0±0.3	-
KIN (0.0) + NAA (1.5)	Internode	35.0	2.8±0.4	1.8±0.4	-
KIN (0.0) + NAA (2.0)	Internode	25.0	1.9±0.6	1.2±0.5	-
KIN (1.0-3.0)+ NAA (1.0-3.0)	Internode	47.3	-	-	-
KIN (1.0-3.0) + 2,4-D(3.0-5.0)	Internode	39.3	-	-	-
KIN (1.0-2.0) +2,4-D(4.0-5.0)	Node	47.0	-	-	-
KIN(0.5-2.0) + NAA(1.0-2.0)	Floral bud	-	-	-	NG
KIN (1.0-2.0) + NAA (1.0-2.0)	Callus	60.2	-	-	-
KIN (1.0-2.0) + 2,4-D(4.0-5.0)	Callus	70.8	-	-	-

Results noted after six weeks of culture, Mean and standard error based on ten replications.

NG = normal growth.

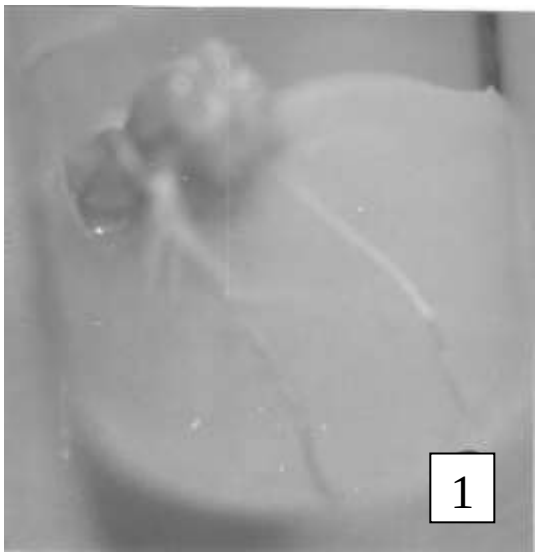

Figure 1. Differentiation of roots from internode cultured on MS medium with NAA (1.5 mg/ L). (X 2.3)

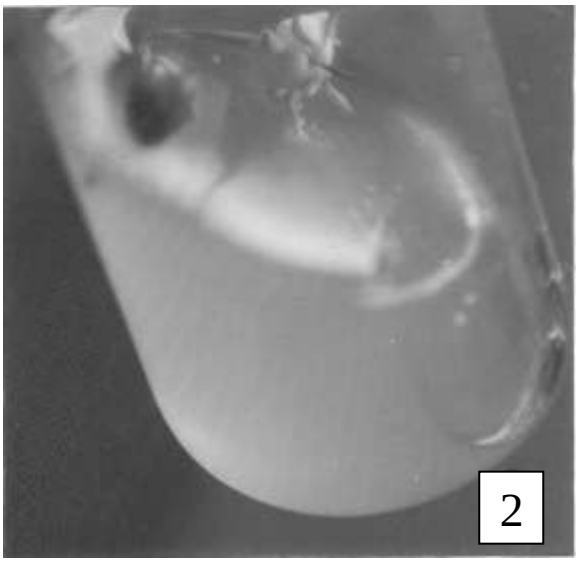

Figure 2.Development of normal flower from floral bud cultured on MS medium with KIN (2.0 mg/ L) and NAA (1.5 mg/ L) (X 2.1)

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CHARACTERISTICS OF ORGANIC COMPOST ORIGINATED FROM *HARPAPHE HAYDENIANA* (WOOD) AND *EISENIA FOETIDA*

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Milli-compost, Vermi-compost, *Harpaphe haydeniana*, *Eisenia foetieda*

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ABSTRACT
Comparative study was conducted to find out the physical, chemical and physico-chemical properties of compost obtained from Millipede (*Harpaphe haydeniana)* called Milli-compost and that of earthworm (*Eisenia foetieda)* called Vermi-compost. The effect of mechanical breakdown of plant-wastes by a group of millipedes called *Harpaphe haydeniana* was studied in a 'microcosm'. The microcosm contained incubated plant wastes, inoculums, soil and millipedes-*Harpaphe haydeniana.* After two months time significant changes were found in soil of microcosm. Concentrations of Phosphorus (P), Calcium (Ca), Potassium (K), Magnesium (Mg), Nitrogen (N) and Carbon(C) were increased. It was found that concentration of all these plant nutrients were more in Milli-compost as compared to Vermi-compost.

INTRODUCTION
Wastes of plant origin can be degraded to compost by the activity of soil macro – invertebrates like millipedes which are major saprophagous fauna that decompose the plant and leaf litter. Millipedes (*Harpaphe haydeniana)* are arthropods belonging to class Diplopoda .They have around ten thousand species. They are detritivores and eat dead and decaying leaves and other parts of the plants. They excrete decomposed organic matter as fecal pellets. These fecal pellets are called compost (Ashwini & Sridhar, 2002). This compost is beneficial to plants in the similar way as vermi-compost (fecal pellets of Earth Worm-*Eisenia foetieda).*

The outcome of the proposed research activity will result into development of technology that will be used in production of compost of high economic value with the help of millipedes and from wastes of plants. The studies taken up in this regard to compare the quality of millipede compost with Vermi-compost so that the millipede compost can be further improved for use in agriculture.

MATERIALS AND METHODS

(a) Three experiments were conducted. One with millipede (*Harpaphe haydeniana*), another with Earthworm (*Eisenia foetieda*) and third experiment was carried away without Millipede or Earthworm.
(b) Millipedes were cultured in wooden boxes called 'microcosm' of 3'x 4'x 3.5' dimension with 3 inches of soil at the bottom of the box.
(c) Soil, cow dung, vegetable waste, leaves, grass and paddy straw were kept in

all the three boxes. Kitchen waste including vegetable peels, grasses and leaves (6kg), paddy straw (1kg) were added periodically in all the three boxes as feeding material.

(d) About 100 Millipedes (*Harpaphe haydeniana*) were put in first box, 100 Earthworms (*Eisenia foetieda)* were put in the second box.

(e) Third box was cultured as control, without millipede or earthworm.

All the boxes were covered with moist sac and kept under thatched roof. The experiment was carried away for two months, (from June 2008 to August 2008).

Periodically Collected Samples were Classified and Designated as under:

Milli-compost (S_1), Ordinary soil (S_2), Vermi-compost (S_3), Ordinary Compost (S_4)

S1 = soil +cow dung + Vegetable wastes + paddy straw + Millipedes

S2 = soil of the given locality

S3 = soil + cow dung + vegetable wastes + paddy straw + earthworms

S4 = soil + cow dung + vegetable waste

LABORATORY ANALYSIS

(A) PHYSICO CHEMICAL PARAMETERS

(a) **pH** : pH of the soil and organic samples were measured using standard pH meter in 1:2 (soil : water) ratio**.**

(b) **EC:** Electric conductivity of the given samples were measured by conductivity meter (EC machine) in 1:2 (soil: water) ratio.

(c) **Organic Carbon:** O.C. was determined by the titration method (Walkley and Black 1934).

(B) CHEMICAL PARAMETERS

(a) **Nitrogen (N):** Available Nitrogen of the samples were determined by Potassium Permangenate (KMnO4) Method (Subbiah and Asija, 1956)

(b) **Phosphorus (P):** Phosphorus was determined with the help of 0.5 M Sodium Bicarbonate as extranatent and Ammonium Molybdate for determination with the help of Spectrophotometer (Datta et al. 1962).

(C) **Potassium (K):** Determination of Potassium of the organic samples were done with 1 N Ammonium Acetate solution using Flame Photometer (Hanway and Heidel, 1952)

(D) **Calcium(Ca) & Magnesium (Mg):** Determination of Calcium and Magnesium were done using Complexometric Titration Method using ethylene diamine tetra – acetic acid (EDTA) , first introduced by Schwartzenbach et al. (1946)

(C) *PHYSICAL PARAMETERS*

Apparent Specific Gravity (Bulk Density), Absolute Specific Gravity, % Pore Space, Water Holding Capacity (WHC), %Volume Expansion - Determination of soil Constants was done using Keen Rackzowski Box.

Table 1. Physico–Chemical characteristics of study samples

Types of samples	pH (1:2)#	EC (1:2)#	Organic Carbon %	Potassium Kg/ha	Phosphorus Kg/ha	Available Nitrogen Kg/ha	Calcium+ Magnesium Meq/100gm
Millipede Compost (S_1)	7.20	0.24	3.55	784	148	499.84	49.43
Ordinary Soil (S_2)	8.20	0.31	0.16	301	22.5	218.68	18.00
Vermi-Compost (S_3)	7.00	1.85	15.4	560	96.63	450.26	47.60
Ordinary Compost (S_4)	7.65	0.32	0.66	326	88	234.30	19.20

#Soil to water ratio

Table 2. Physical properties of different study samples:

Types of samples	Apparent Gravity (Bulk Density)	Absolute Specific Gravity	% Pore Space	%Water Holding Capacity (WHC)	Volume Expansion
Millipede compost	1.08	1.76	55.60	25.98	28.80
Ordinary soil	1.24	2.44	50.24	24.15	0.88
Vermi-compost	0.63	1.24	67.15	70.25	22.67
Ordinary Compost	1.29	2.51	55.3	24.90	6.07

RESULTS AND DISCUSSION

Chemical and physical properties of the milli-compost, ordinary soil, vermi-compost and ordinary compost were studied and data were tabulated (Table 1 & 2)

Chemical Properties

Available Nitrogen (N): Available Nitrogen content varied from 218 to 499 kg/ha. Lowest value was observed in ordinary soil (S2) due to low organic matter content which generally contributes to the available forms of Nitrogen, as indicated by higher value in Milli-compost and vermin-compost.

Available Phosphorus (P) : Similarly, as that of available Nitrogen, higher values of available Phosphorus also showed that digested organic matter through millipede and Earthworms releases more available forms of 'P'. Available P ranged between 22.5 Kg/ha and 148 Kg/ha. Available 'P' content was higher in Milli-compost than Vermi- compost (Table 1).

Available Potassium (K): It ranged from 301 to 784 Kg/ha. Highest K content was observed in Millipede compost. It may be due to addition of higher amounts of millipede casts to the compost during their activity. Millipede compost observed to be superior to vermi compost with regard to K content.

Available Calcium + Magnesium: As observed above both of these elements were also high in organic samples compared to Soil samples. However, highest value was observed in millipede compost. This is attributed to digestion of vegetable and crop based wastes by millipede activity to release of Calcium and Magnesium. Further, addition of worm casts weight contributed to their amount in the compost (Table. 1).

Physical Properties

Bulk Density: Bulk Density varied from 0.63 to 1.29g/cc among the samples. Lowest B.D. was seen in Vermi- compost. As percent organic Carbon increases the Bulk Density decreases.

Particle Density: As this parameter depends on inorganic components of the soil, lesser inorganic components contributed to lower values of Particle Density in vermin-compost and Millipede-compost. It ranged between 1.24 to 2.51 g/cc.

% Pore Space: Total pore space depends on finer inorganic and organic materials of the samples. As observed, the higher amounts of finer materials in organic samples the % pore space was high compared to samples with higher coarser materials. The highest % pore space was observed in vermi-compost (67.2%) followed by 55.6% in case of Milli-compost.

% Water Holding Capacity: Similarly, the highest %WHC (70.31) was observed in Vermi- Compost followed by Milli-compost. This is attributed to higher absorption and adsorption properties of organic components present in them as compared to soil. Lower WHC of Milli-compost is due to high chitinous content of Millipede casts and mouldings to the compost (Table -2).

%Volume Expansion: Volume of Expansion depends upon % of clay and organic matter content in the sample. Even though % clay content in Vermi- compost and Millipede-compost is low because of high organic material the values of %Volume expansion are high in these materials as compared to soil samples. %volume of expansion varied from 0.88 to 28.8.

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RESPONSE OF MATURE ENDOSPERM OF SOME VARIETIES OF RICE (Oryza *sativa* L.) FOR THEIR CALLUSING AND DIFFERENTIATION

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ABSTRACT

Rice is one of the most important cereals and it is a staple food crop of the most of the Asian countries. It fulfils 40% of the nutritional needs of a vast population of the world. In comparison to the population explosion of the world the production of rice, has not been reached up to the mark. In this regard, it is a high time, that the production of rice should be increased scientifically. But before going in detailed studies such as genetic engineering, protoplast culture, anther culture etc, it is essential to screen the rice varieties from its mature endosperm level first. In this perspective four varieties of rice had been undertaken for the response of their mature endosperm on different concentrations of 2, 4-D for their callusing and upon joint concentration of IAA and KN for their differentiation. Out of the four varieties of rice, the mature endosperm of Kanak and Pusa-Basmati showed their best callusing and differentiation in comparison to Tulsi and Birsa-101. For the best callusing, the concentration 4mg/l of 2, 4-D was confirmed. On the other hand the combined concentration of IAA (2mg/l) + KN (4mg/l) was proved as the best differentiating concentration of the growth regulators.

INTRODUCTION

Although in terms of area, the cultivation of rice comes next to wheat, but rice ranks first regarding the nutritional values among the different food crops. Rice provides more calories in respect to other cereals (De Datta 1981).

Rice is an annual herb, which belongs to the family *Poaceae.* Its inflorescence is of Spikelet subtype of the type Racemose. Its flower has got six stamens and one pistil. It has got two perianths, which become modified into two lodicules.

India has the largest rice growing area with 42 million hectares, which is followed by People's Republic of China. About 90 million tons per hectare is the annual production of rice in India (Ahmed Ilyas *et al*. 2006).

On worldwide perspective rice production has to be increased to cope with the global population explosion (Athawal 1972). In India, to maintain the present level of self sufficiency annual rice production has to be increased to 115 million tons by 2020 (Ahmed llyas et al. 2006). Hence, the most modern technology should be adopted to explore artificially induced genetic variability in rice improvement programme. In past time many investigators have worked upon rice tissue culture (Bajaj and Bidani 1980, Zafar *et al*. 1992, Ghosh *et al*. 1993, Datta *et al*. 1996, Usha Rani and Reddy 1996, Khanum *et al*. 1997, Cooking *et al*. 2003, Jelodar et *al*. 2003). Some scientists

had worked upon rice mature endosperm (Sharma 1986, Nakano et al. 1975, Nag 1970).

MATERIALS AND METHODS

In the present investigation two lowland (Kanak and Pusa Basmati) and two upland (Tulsi and Birsa-101) varieties of rice of Jharkhand had been undertaken. The seeds of the above varieties of rice had been collected from Birsa Agriculture University, Kanke, Ranchi.

MS (Murasige and Skoog 1962 medium) was used as basal medium for the present investigation. Analytical grade chemicals and double glass distilled water were used for the preparation of medium. To solidify the medium 1.0% Difco Bacto Agar was used. The p^H of the medium was maintained at 5.8 before autoclaving using 0.1 N NaOH or 0.1 N HCl. About 20 ml. of the hot medium was dispensed into each culture tube (15.0 x 2.5 cm). Later on all the tubes were plugged with nonabsorbent cotton wrapped in cheese cloth. After some time, the culture tubes were autoclaved at 1.06 kg/sq. cm for 15 minutes.

Since the explant (mature endosperm) was not grown in *in-vitro* condition, there was a need for their surface sterilization. The surface sterilized mature endosperm was placed on sterile petridishes under aseptic condition. Mature endosperm of these varieties were cut into many pieces and two pieces of endosperm were implanted upon the nutrient medium in each culture tube under aseptic condition and maintained at the temperature 25+ 5^0C & the R.H. 80%. The calli, which were developed from the mature endosperm were sub-cultured for their differentiation in the differentiating medium.

RESULTS AND DISCUSSION

The inoculated explants (mature endosperm) induced callusing on MS medium supplemented with different concentrations of 2, 4-D. The induced callus was mostly granular, friable and pale yellow (Fig. 1).

It was observed that, when the concentration of 2, 4-D was 2mg/1, Kanak showed 40% response, which was followed by Pusa Basmati, Tulsi and Birsa-101. However, when the concentration of 2.4-D was 4mg/1 the best callusing 81% was induced by Kanak, which was followed by Pusa Basmti 75%, Tulsi 66% and Birsa – 101 62%. But at higher concentration of 2, 4-D tendency of callusing was gradually declined (Table – 1).

On the contrary, Sharma (1986) reported that at higher concentration of 2, 4-D excellent callusing was induced in some varieties of rice. However similar to our findings Zagorska *et al*. 1997 reported that the lower concentration of 2, 4-D is the most potent for the induction of callus.

From the Table 1, it was also inferred that the low-land varieties of rice responded better percentage of callusing than the upland varieties of rice.

Table – 2 clearly shows the varietal differences in the differentiation. At the strength 2 mg/l of IAA and 4 mg/l of KN, the mature endosperm derived calli of Kanak and Pusa Basmati started their differentiation fast i.e., from the first week of inoculation. However, at the same concentration of above growth regulators Tulsi and Birsa – 101 started their differentiation from the second week and their rate of differentiation was comparatively slow. It was also seen that numbers of differentiated roots were more than the number of shoots. In case of Pusa Basmati, it was observed that number of roots was many, but number of shoots was only two but both the shoots were coiled (Fig.– 02). More or less similar condition was observed in Kanak, Tulsi and Birsa – 101.

Hence, it became clear that the combined strength of IAA (2 mg / l) + KN (4mg/l) was the best strength as upon this strength, the mature endosperm derived calli of all the varieties of rice undertaken had differentiated very well. Similar to our findings, Sharma (1986) reported that MS +

IAA (2 mg/l) + KN (4 mg/l) was the best differentiating medium for the differentiation of mature endosperm derived callus of some varieties of rice.

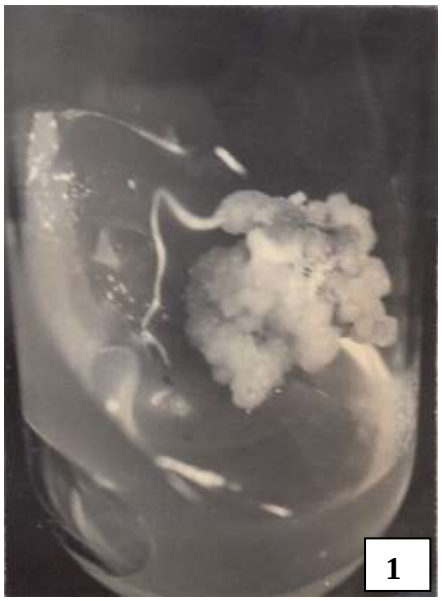

Fig. – 1. Mature endosperm derived callus of Pusa Basmati

Fig – 2 Differentiation in Mature Endosperm derived Callus in Pusa Basmati

TABLE- 1 Percentage of culture showing callus on MS + different concentrations of 2.4-D + YE (3000 mg/l) from the mature endosperm of the different varieties of rice

Varieties	Concentrations of 2, 4-D				
	2 mg /l	4 mg / l	6 mg /l	8 mg / l	10 mg /l
Kanak	40%	81%	71%	69%	62%
Pusa-Basmati	30%	75%	67%	73%	56%
Tulsi	15%	66%	65%	64%	50%
Birsa – 101	10%	62%	60%	61%	48%

Data recorded after 4 weeks of culture, YE - Yeast Extract

CONCLUSION

From the above discussion, it was concluded that best strength of 2, 4-D was 4 mg/l for the callusing as upon this concentration, the mature endosperm of all the varieties of rice undertaken induced their best callusing (Kanak 40 %, Pusa Basmati 30%, Tulsi 15% and Birsa-101 -10%). Regarding, differentiation, it was concluded that mature endosperm derived callus of Kanak and Pusa Basmati induced their best differentiation 42% and 36% respectively, at the combined strength of IAA 2 mg / l + KN 4 mg / l. It was followed by Tulsi 30% and Birsa -101, 25 %. Hence, finally it is concluded that lowland varieties of rice responded better for callusing as well as differentiation in comparison to upland varieties of rice.

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TABLE-2 Differentiation of Mature Endosperm derived callus in different varieties of rice, subcultured on MS + IAA (2 mg/l) + KN (4 mg / l)

SL No.	Varieties	% of differen-tiation of roots and shoots	Mean no. of roots per culture	Mean length of roots (cm.)	Mean no. of shoots per culture	Mean length of shoots (cm.)	Rate of Differen-tiation
1.	Kanak	42	25.1± 0.2	2.2±0.1	3.5±0 .1	1.7± 0.2	Fast
2.	Pusa-Basmati	36	20.1±0.1	1.6 ±0.2	2.1 ± 0. 1	1.8± 0.1	Fast
3.	Tulsi	30	10.2 ±0.4	1.5±0.1	1.6± 0.3	1.0± 0.3	Average
4.	Birsa-101	25	8. 3 ±0.3	1.3 ±0.2	1.4 ± 0 .2	0.8 ± 0.2	Average

Data recorded after 4 weeks of the culture, mean ± S. E

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THE NOTE OF MELANCHOLY IN MATTHEW ARNOLD'S POETRY

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ABSTRACT
Matthew Arnold was deeply influenced by his age. It was an age in which the Industrial Revolution had increased the wealth and prosperity of the nation. The people had become materialistic in attitude and the spiritual life had been given up by the masses. There was an obsession with the religious controversies of the age which was the result of Darwin's *'The Origin of Species'* and the advancement of science. It was no longer possible to believe blindly in the biblical story of creation told in the Genesis. Man was wavering between religion and science. Arnold suddenly found himself without any control in a world of lost faith and desire. In Arnold (1822-1888) one can thus catch the first glimpses of Victorian pessimism, the pessimism of an age of transition and uncertainties. His poetry thus reflects his temperament - one who is analytical, introspective, prone to weight and reluctant to be swayed by emotions.

MATTHEW ARNOLD

"The poetry of later paganism lived by the senses; and incidentally, the poetry of medieval Christianity lived by the heart and the imagination. But the main element of the modern spirits life is neither the senses nor understanding, nor the heart and imagination; it is the poetry of reason'' (Compton 1991)

In this last phrase the germ of the poetry of pessimism is present. It was the endeavour to rationalize the visions of the imaginative life that led Arnold, Clough, Fitzgerald, and James Thompson into that mood of wishful melancholy that crystallized into a more or less pessimistic criticism of life. In Arnold (1822-1888) one can thus catch the first glimpses of Victorian pessimism, the pessimism of an age of transition and uncertainties. In temperament, analytical introspective, prone to weigh, reluctant to be swayed by emotions, he felt the intellectual difficulties of his time, and could never quite escape their disturbing atmosphere. Empedocles solves the problem by throwing himself into a ravine. Arnold more controlled and less emotional, throws himself into a sonnet, or elegy, and thereby eases his mind.

Matthew Arnold was deeply influenced by his age; an age in which the Industrial Revolution had increased the wealth and the prosperity of his nation. The result was that the people became materialistic in attitude. The spiritual values of life had been forsaken by the masses. Moreover, Arnold was obsessed with the religious controversies of the age which came in the wake of Darwin's *'The Origins of Species'* and the advancement of science. It was no longer possible to believe implicitly in the biblical story of creation told in Genesis. Man was wavering between religion and science. The old faith was fast crumbling down and there was nothing to take its place. Arnold felt himself suddenly set adrift in a world of lost

faith and blind desire. He experienced a poignant regret at the decay of the old faith and the impossibility of accepting the new philosophy of science with its alluring appeal. 'Dover Beach' (1967) is a fine reflection of Arnold's melancholy temperament and his dismay at the retreating tide of religious faith:

"The sea of faith
Was once, too, at the full and round earths shore
Lay like the folds of a bright griddle furled.
But now I only hear
Its melancholy, long withdrawing roars'' (Palgrave 1985)

This attitude towards religion was the most characteristic feature in Arnold. His negative attitude towards faith was closely related to his position in history. He stood just far enough away from the French revolution to look back upon it and its effects in a spirit of criticism. It had shattered the old world, and left in the place of an ordered system only –

"blocks of the past, like icebergs high"
floating "on a rolling sea" (Walker Hugh 1964)

On the other hand, he was not far enough away to enable him to see what was to be the nature of the new world which must arise from the ruins. He was:

"Standing between two worlds, one dead,
The other powerless to be born" (Walker Hugh 1964)

These fundamental convictions, that the faith which had shaped Europe was gone, and that the feudal mould of her society was shattered, are the secret of the wonderful attractive power exercised over Arnold by Senancour, the author of 'O**bermann'.** Senancour too had felt the vastness of the change, and it is the cause of that -

"Ground-tone of human agony" (Walker Hugh 1964)
which sobs through his work. Men holding such convictions must inevitably be melancholy; and Arnold the poet was habitually melancholy. In this respect his verse is unlike his prose, which has more of the charming gaiety and playfulness of his own manners. Both gaiety and the melancholy was feature of his character. J.C Shairp has touched the contrast with admirable taste in the lines which describe the youthful scholar of Balliol:

"So full of power, yet blithe and debonair,
Rallying his friends with pleasant banter gay,
Or half-a-dream chanting with jaunty air
Great words of Goethe catch of Beranger:
We see the banter sparkle in his prose,
But know not there the undertone which flows,
So calmly sad, through all his stately lay" (Walker Hugh 1964)

Looking thus upon life, Arnold naturally could not be among the optimists. He couldn't be like Macaulay, who was at ease in his Zion because of the material progress of the time. Nor could he be like Browning, who was convinced that;

"God's in his heaven,
All's right with the world" (Legouis 1934)

Arnold could find no solace among the former class, because he saw that the "something that infects the world" could be cured not by material but only by spiritual means. Neither could Arnold be among the Browningite optimists. To him it meant the assertion that the new religion had been born, without the proof. Still less could such a man feel himself in harmony with the attempts to revert to the Middle Ages. He thought the middle ages irrational. He knew that any attempt to blot or blur the record of human progress must end in failure. In '**A Summer Night'** (1853) he has drawn

imperishably, under the figure of a helmsman, the picture of him who attempts to steer his way across the ocean of life by any other chart than that of truth. The tempest strikes him,

"And between
The lightening-bursts is seen
Only a driving wreck,
And the pale master on his spar-strewn deck
And with anguished face and flying hair
Grasping the rudder hard,
Still bent to make some port he knows not where,
Still standing for some false, impossible shore" (Legouis 1934)

In Arnold's opinion, that which the time demands above all things is the discovery of some shore, towards which to steer. Men need some Columbus to guide them over a trackless ocean to new continent of which he is aware of, though they are not. The misfortune is that men can find no such captain. Goethe the "physician" of Europe's "Iron Age" had laid his finger on the seat of the disease. However, he failed to find a cure. Arnold never conceived himself to be capable of succeeding where Goethe had failed. On the contrary; he rather teaches that the problem has grown so complex that scarcely any intellect could suffice for its solution.

This feeling of almost insurmountable difficulty is the secret of Arnold's melancholy:

"It gives a sense of brooding pause, almost of paralysis of action, to his verse. It is the secret of his attraction for some minds and, of an alienation amounting almost to repulsion between him and many others. It makes him, in verse as well as in prose, critical rather than constructive. His much–condemned definition of poetry as criticism of life; is at least true of his own poetry." (Legouis 1934)

In all his deepest poems, in '**Thyrsis'** (1866) and '**The Scholar Gipsy' (1853)** in '**Resignation**' (1849), in '**A Southern Night'**, Arnold is passing judgement on the life of his age, the life of his country, the lives of individual men.

This inner gloom of the poet was reflected in his poetry up to 'New Poems' of 1867, when his mood changed and his pessimism was a little ameliorated. Poems of the earlier volume 1849, 1852, 1855, 1857 were all enveloped in gloom .The 1852 volume of his poem finds him still envying the happiness of the birds, for man's lot is to know that;

"Peace has left the upper world
And now keeps only in the grave" (Tilak 1992)

The essential greatness of his poetry may be found in what has been called "the dialogue of the mind with itself. "Its most prominent characteristic is a form of melancholy born of a painful awareness of a sensitive individual caught between a dead faith and an uneasy rationalism. Self-sufficiency has always been the classic advice of philosophy in a disorganized society;

"Live In Yourself" (Trilling Lionel 1949)

Wrote Senancour, and added;

"and seek that only which does not perish" (Trilling Lionel 1949)

Self cultivation in loneliness, in the face of the degeneracy of the world, with reference to some eternal but ill defined idea – it is a familiar burden of Matthew Arnold's communion with himself. In the midst of a jangled and uncertain world he tells himself to learn;

"That an impulse, from the distance
Of his deepest, best existence,
To the words "Hope, Light, Persistence",

Strongly stirs and truly burns" (Trilling Lionel 1949)

The genuine Arnold was an elegist of deep tenderness and solemnity; a stoic poet of high seriousness, his poetry was entirely reflective. He does not shine in constructing a story. He can express melancholy feeling with rare purity and, when he chooses, even with an emotion that is sometimes poignant. To quote Walker Hugh (1964);

"Nothing in Arnold's verse is more arresting than its elegiac element. It is not too much to say that there is no other English poet in whom the elegiac spirit so reigns as it does in him; ---he found in the elegy the outlet, of his native melancholy of the 'Virgilian cry'over the mournfulness of mortal destiny. It is the natural tone of an agnostic who is not jubilant, but regretful of the vanished faith, --- regretful of its beauty, regretful of the lost promise."

Not only are Arnold's elegiacs numerous, they are almost among his finest works. And always his spirit was that of Gray rather than of Milton or Shelly or Tennyson. The elegies are not the elegies merely of the individual. The subject of '**Rugby Chapel'** is his own father. In '**A Southern Night'** it is his brother. In '**Westminster Abbey'** and '**Thrysis**' his most intimate friends ; but even in these instances of keen personal sorrow the poet widens his view and treats human destiny, almost as much as Gray does in the '**Elegy Written in a Country Churchyard'.** And precisely the same spirit inspires poems which are not elegiac in the sense of being laments for individual men. '**Thyrsis',** the poem on Clough, is scarcely more elegiac in spirit than 'The **Scholar Gypsy'**. In Both the real theme is the condition of modern life;

With its sick hurry, its divided aims,
Its heads overtaxed its palsied hearts." (V Gopalan Nair 1972)

It is so too in the '**Obermann**' poems, the **'Stanza from the Grande Chartreuse'** the **'Stanza from Carnac', 'Heine's Grave'** and **'Memorial Verses.** In all there is the same grandeur of utterance, and the same calmly sad undertone. They are the voice of a spirit almost crushed beneath the burden of life. Hence, there is a grave scolding note in Arnold's verse. He is against the materialistic spirit. There is a plea for gentleness and quite as against the bustling energy. It was this which attracted him to monastic life. Arnold denounces life. He believed that man leads his life in grief and despair without ever experiencing the glow or joy of life. In '**Scholar Gypsy'** the tragedy and pathos of man's lot in universe is pathetically presented;

"For whom each year we see
Breeds new beginnings, disappointments new;
Who hesitate and falter life away,
And loose tomorrow the ground won to-day"

The inevitable loneliness of humanity was another cause of Arnold's melancholy, and most beautifully expressed by him;

"Yes: in the sea of life enisled,
With echoing straits between us thrown
Dotting the shore less watery wild,
We mortal millions live alone."(Palgrave 1985)

The pathos of the poems on his dead pets lies in the sense of their isolation from their human keepers. The great power of nature also suffers from the same loneliness:

The solemn peaks but to the stars are known,
But to the stars, and the cold lunar beams;
Alone the sun rises, and alone
Spring the great streams" (Walker Hug 1964)

Faced with a fate which seems indifferent and even hostile to human needs, men have traditionally turned for consolation to love, either secular or religious, and nature. Wordsworthian though he claimed to be and worshipper of natural beauty, especially clear rivers, lakes and seas, Arnold had little faith in the divine beneficent powers of nature. He had Wordsworth's charm, but neither his cheerfulness nor his detachment. Arnold sometimes betrayed the influence of Byronic disenchantment. However he substituted a melancholy resignation for Byron's mode of revolt.

Arnold's conclusions regarding human nature were also not very favourable. Most men, for him, live meaningless lives in a brazen prison, and the few that escape behave with complete irresponsibility and come to wreck. The poet asks:

"Is there no life, but these alone?
Madman or slave, must man be one". (Sen Gupta 1992)

But in '**Rugby Chapel'** he is willing to admit that though most men live wasted lives and die forgotten, some strive after an ideal that is fruitful and memorable. But even these would fall by the wayside unless upheld by strong souls like his father, through whom he can at least believe that there were great and good men in the past who were servants and sons of god.
The 'vague dejection' that weighed down upon his soul was a chronic condition, he was a little too cold and much too sophisticated to enjoy a first love – affair. Arnold feels painfully helpless in "Times' current strong." In spite of Marguerite's charm, he derived no real happiness from his meetings with her. His most passionate desire was to be alone on the snowy peaks. Arnold therefore had no great faith in the efficacy of love.

The story of ambivalent love was a characteristic one of the 19th century.
Rousseau's '**Confessions**' had led the ground for the understanding of emotional ambivalence. From Pushkin to Clough, poets tell of lovers separated not by difficult circumstances but by the inability of the men to know the true tendency of his heart. If his love story was paradoxical no one was more aware of it than Arnold himself. He believed that his affair had been an emotional failure. The realization of the general inability of the human souls to meet was strongly embedded in him;

"Thou hast been, shalt be, art, alone". (Trilling Lionel 1949)

It was only once or twice that he gave love its true place and explored its significance as in the poem '**The Buried life'** which for all its melancholy has no self-sufficient pessimism. It is distressing that Arnold should have lapsed from this fundamental faith, to the extent of denying the very existence of love even in the very act of invoking it for himself.

"Ah, love let us be true
To one another; for the world, which seems
To lie before us like a land of dreams
So various, so beautiful, so new,
Hath really neither joy, nor love, nor light. (Palgrave 1985)

But Arnold sought to do more in his poetry than to utter the turmoil of his spirit. To quote Goodman;

"Brought up in the classical tradition of English Education, he attempts in narrative poetry to reproduce something of the restrained and ordered beauty of the Greeks.
In '**Sohrab and Rustum';** we have the many reminiscences of the Homeric manner; but even here the modern romantic melancholy appears through the classical form." (Goodman 1988)

Arnold's mood had brightened and the age itself had grown less disturbing by the time he published the '**New Poems'** of 1867. The primary ground for the brighter spirit was his entering upon new and exhilarating forms of activity, with wider recognition. However Arnold could never achieve a view of life which may be called optimistic. His tendency was to suggest that the best one can hope to reach was a state of calm;

"The General life, which does not cease,
Whose secret is not joy but peace" (Tilak 1992)

The lesson he himself drew from the world was resignation. One was the somewhat ignoble resignation of the cloister, which seems to be Arnold's choice in the '**Stanza from the Grande Chartreuse'**. The other was the stoic resignation inspired by a sense of duty not helped by any hope of reward. His "rigorous teachers" forbade the surrender of intellect and enjoined the facing of all difficulties at whatever cost, and even though the end were failure. It was Browning who taught that under apparent failure there may be hidden real success, but the spirit of the teaching inspires Arnold's work. There is a touch of hope as well as of pity in ***"A Summer Night'.*** It has melancholy, but it also has a hardly stoicism.

One vital point regarding Arnold's melancholy is that it is not real because his melancholy is not the melancholy that dejects and depresses. It is not the melancholy that sucks ones strength and spirit, the melancholy that palls with pessimism and leaves one with despair, but a wistful feeling that:

"Resolve to be thyself, and know, that he
Who finds himself, loses his misery". (Trilling Lionel 1949)

What could be more profoundly melancholic than the exquisite poem **'Dover Beach'?** Yet there is nothing maudlin, nothing unmanly about it, how delicate is the pathos in the more fanciful poem '**The Forsaken merman':**

"There dwells a loved one
But cruel is she;
She left lonely for ever
The kings of the sea" (V Sachithanandan 1978)

Though the ache was always there at the heart of Arnold's poetry, there was also hope and cheerfulness. To quote Compton Reckett-

"No whining with Arnold, no luxury of grief, no sentimental pessimism. Neither is there any joy, nor any real peace. It is the serenity of a troubled but brave spirit." (Compton 1991)

Conclusion

One cannot be enthusiastic over Arnold's poetry, for the simple reason that he himself lacked enthusiasm. He was however a true reflection of a very real mood of the past century, the mood of doubt and sorrow. Though, marked by the elemental note of sadness, all Arnold's poems are distinguished by clearness, simplicity, and the restrained emotion of his classical models. Finally to sum up in the words of Legouis and Cazamian:

"The true tone of Arnold's temperament is Sadness: a pensive melancholy essentially Romantic in origin, which gains sterner tones from the more definite anxieties of the century, now more sedate and mature. Here again, as in the case of Clough, we find the uneasiness of a soul torn between meditation and strong self–possession on one hand , and on the other, the claims of action; but with Arnold there is above all the feeling of a wound, the loss of cheerful temper which Clough owed to the possession of a

satisfying faith. The vague Christianity of Arnold, the moral pantheism to which all the philosophical reflection tends, seems to have left in his inner self an emptiness a scar which is revealed only in his poetry . The loss of all positive belief came as a momentous experience to him as to many of his generation, and hopelessly destroyed all his joy of life" (Legouis and Cazamian 1981).

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ROLE OF TRIBAL WOMEN IN THE CONSERVATION OF AGRICULTURAL BIODIVERSITY OF JHARKHAND

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ABSTRACT

Role of tribal women in conservation of agricultural biodiversity was studied keeping in view the threat from hybrid and genetically modified seeds. 64 samples of women from all over the Jharkhand were taken for the study. There are 32 tribal groups in Jharkhand. During investigation it was found that women play very important role in food production, seed selection, storage, harvesting, food processing and maintaining soil fertility. Women collect various wild plants and grow them in their kitchen gardens to conserve some rare species and traditional food crops given in the list. Thus it is concluded that tribal women with their respect and sense of tradition and culture can play an important role in biodiversity conservation.

INTRODUCTION

Jharkhand is a state in eastern India carved out of the southern part of Bihar in November, 2000. It has an area of 74,677 Km^2. The state has a population of 26.90 million. The population consists of 28% tribal, 12% scheduled castes and 60% others. The sex ratio is 941 females to 1000 males.

Most part of the state lies on the Chotanagpur Plateau, which is the source of rivers like Koel, Damodar and Subarnrekha. The climate is moderate with summers ranging from $16^0 – 45^0$ C and winters from $10^0 – 28^0$C. Soil composition varies from red soil (Damodar Valley) micacous soil (Koderma) black soil (Rajmahal) to laterite soil (Santhal Pargana).

Present study was undertaken to find out the role of tribal women in conservation of biodiversity in Jharkhand keeping in view modern monoculture practice in agriculture and invasion of hybrid and genetically modified seeds.

MATERIALS AND METHODS

Study was undertaken with women of sample size 20 of different tribal groups of Jharkand. Two samples were taken for each tribal group, thus, total samples were 64 spread all over the state. Data collected were analyzed to find the agricultural crops grown and agricultural practices undertaken. Jharkhand has 32 tribal groups. Women (Fig. 1, 2, 3) take leading role in agriculture and house hold activities. Tribal groups of Jharkand are:

• Asur • Birhor • Kisan • Mal paharia • Baiga
• Chero • Kora • Munda • Banjara • Chick Baraik
• Korwa • Oraon • Bathudi • Gond • Kol
• Parhaiya • Bedia • Gorait •Kanwar •Santhal Paharia
• Binjhia • He • Khond • Sauria • Bhumij
• Kharwar • Lohra • Savar • Birjia • Karmali
• Mahli • Ho

Figure 1: Tribal women of different tribal groups

Figure 2: Women tilling the field
Figure 3: Women transplanting paddy

RESULTS AND DISCUSSIONS

Biodiversity and agriculture are strongly interdependent because while biodiversity is critical for agriculture, agriculture can also contribute to conservation and sustainable use of biodiversity. The loss of diversity in food crops is the greatest threat to food, fodder, fuel and fiber. Biodiversity is essential to maintain ecosystem services such as soil and water conservation and also allows adaptation to climatic change (Goel et al. 1984).

In agriculture societies around the globe women have tended to be the custodians of biodiversity. Tribal and rural women living mostly in biodiversity rich areas posses a wealth of knowledge to use and conserve plant genetic diversity (Verma and Jha 1996). This knowledge, collected and developed over years of observation by trial and error, inference and inheritance has remained with the tribes (Devadas 1994).

During investigation it was found that in Jharkhand, tribal women play an important role and take part in all activities right from farming, collecting food, fodder and fuel from the forest to marketing their produce in local hats. There is no restriction to their movement unlike other communities. Because of their multiple roles and responsibilities as providers of food, fodder, fuel, health care and other household needs, women have knowledge of various uses of plants. They have clear understanding of seasonal variations and availability of edible and medicinal plants. They procure food items from the wild according to the season or whenever they are required.

Men are normally responsible for mono cropping systems and women for more diversified systems such as home gardens. Such diverse systems can be referred to as "living gene banks" that are used for *in situ* conservation and sustainable use of a wide range of plant genetic resources.

Women play very important role in food production, seed selection & storage, harvesting, food processing and maintaining soil fertility. Women collect various wild plants and grow them in their kitchen gardens. The elderly women in the family are given the honour of selecting seed for storage (Ramprasad 1999). They constitute a

"memory bank" of indigenous germplasm. Most of the tribes prefer traditional cultivars which are drought resistant and to some extent disease resistant and pest tolerant. These crops have been preserved due to the conservation habit of these communities over the years. These traditional cultivars also suit local dietary habits and can be easily cultivated without external inputs (Verma and Pandey 1991).

Analysis of data revealed that tribal women cultivate different types of food crops including some rare and traditional crops.

Plant species cultivated by the tribal communities in Jharkhand are:

I) CEREALS:

Scientific Name	***Local Name***	***Use***
Avena sativa L.	Jaie	As food grain
Eleusine coracana	Madua	As food grain
Hordeum vulgare L.	Jau	As food grain
Oryza sativa L.	Dhan	• As bhat (Boiled Rice) • Powder used to make "Chilka Roti" • Rice Wine, "Hadia"
Panicum miliaceum L.	Cheena	As food grain
Panicum sumatrense	Gundli	As food grain
Pasphalum scrobiculatum	Kado	As food grain
Setaria itatica L.	Kauni	As food grain
Sorghum vulgare	Jowar	As food grain
Triticum aestivum L.	Makka/ Janra	As food grain

II) LAGUMES:

Scientific Name	***Local Name***	***Use***
Cajanus cajan L.	Rahar	As pulses
Phaseolus mungo	Mung/Birhi	As pulses
Lathyrus satirus L.	Khesari/Khasari	As pulses

III) OIL SEEDS:

Scientific Name	***Local Name***	***Use***
Azadirachta indica	Neem	As medicinal oil
Brassica campestris	Sarson/Beswar	As edible oil
B. juncea	Rai	As edible oil
Carthmus tinctorius L.	Kusmi/Kusum	As edible oil
Guizotia abyssinica	Surgunja/ Ramtila	As edible oil
Linum usitatissimum	Alsi/ Adri	As edible oil
Madhuca indica	Mahua/Kachra	As edible and medicinal oil
Pongamia pinnata L.	Karanj	As an antislptic, lamp oil and biofuel.
Sesamum indicum L.	Til	As edible oil

IV) VEGETABLES:

Scientific Name	***Local Name***	***Use***
Abelmoschus esculentus L.	Bhindi/ Ramtori/ Ramjhing	• As vegetables • Dried seeds used to make beverage • As medicine
Amaranthus Sp.	Lalsag/ Chaulai	• Leaves used to make "sag"
Amorphophallus commutatus	Jungli Suran	• As vegetables • Dried and powdered for storage.
Artocarpus heterophyllus	Kathal	Fruits & seeds used also as vegetable
Benincasa lispida	Kathua	Used to make "sag"
Chenopodium album L.	Bathua	Used to make "sag"
Cocccinia indica	Kundru	As vegetable
Colocasia esculenta	Arvi	leaves petioles, tubers all edible, as vegetable

Cucurbita pepo	Kohda/ Khonar	Flowers & fruit edible, petha (sweet meat) is prepared from the fruit.
Dioscoria alata L.	Suran	Eaten baked boiled or ground into flour.
Ipomea batatas	Kanda	• Eaten raw, boiled or roaster • Green top used as fodder
Legenaria siceraria	Lauki/ Loa	• As vegetables • Green fruit to prepare sweets • For making water jugs & utensils.
Luffa acutangula	Jhinga	• As vegetables • Dried fruit used as bath sponge
Lycopersicon esculenta	Bilayti	Eaten raw or cooked
Momerdica charantia	Karela/ Karla	• As vegetables. • Medicinal value
Moringa olefera	Joki	• Leaves, flowers & fruits edible • Medicinal value
Raphanus sativus	Mooli/ Moola/ Murai	Roots and leaves eaten raw or cooked
Solanum melongena	Baigan	• As vegetable • Medicinal value
Solanum tuberosum	Alu	• Tubers as vegetables • Small tubers used to make alcohal.
Tricosanthes dioica	Patal	As vegetable

IV) FRUITS:

Scientific Name	***Local Name***	***Use***
Agale marmelos	Bel	• Eaten as Fruit. • Used to make beverage • Medicinal value
Artocarpus heterophyllus	Kathal	Eaten as fruits
Coriaria arborea	Toot	Eaten as fruits
Ficus caricat L.	Anjir	Figs edible
Psiduim guajava L.	Amrood	Eaten as fruits
Mangifera indica L.	Aam	• Eaten as fruit • Young unripe fruits made into pickles, powdered and also used as medicine
Syzygium cumini	Jamun/ Jam	Eaten as fruit
Zizyphus Jujuba	Ber/Bair/Koer	Eaten as fruit

In addition to these the tribal women collect many useful products from the forest.

Some rare biodiversity conserved and cultivated by tribal women are:

1) Broom Grass *(Thysanolaena maxima)* – Panicles are used for making soft brooms.
2) Chironji *(Buchanania latifolia)* – Seeds are edible, used for making sweets and has medicinal value.
3) Nux Vomica *(Strychnos nux – vomica)* – Medicinal value.
4) Kachari / Gurmi *(Cucumis melo L.)* – Collected from crop fields and forests. Fruits eaten raw and has medicinal value.

However many tribal communities are changing their livelihood with the advent of more infrastructure, mining and other activities. In the race to catch up with the rest of "modern communities", they are

forgetting their traditional knowledge of sustainable use of natural resources. Even those who still practice their traditional occupation of farming are replacing the local cultivars (specially the minor millets like Madua, Cheena, Kado, Gundli etc) with genetically improved varieties (specially of rice), thus promoting mono cropping. This trend is a serious threat to biodiversity conservation (Raven 1985).

Women with their respect and sense of tradition and culture can play an important role in biodiversity conservation (Ravi Shankar & Selvan 1996). There is a real danger of losing important agricultural knowledge by failing to pay attention to tribal women's farmer practices (Ravi Shankar et al. 1994).

Therefore, it is necessary to -

- Recognize the value of tribal women farmer's knowledge and skills.
- Revive the time tested local agricultural practices.
- Establish link between tribal women farmers and agriculture research institutions.
- Involving women in decision – making in agricultural biodiversity conservation strategies.

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General Article

GANDHI'S ECONOMIC GLOBALISATION AND ECONOMIC MAN OF THE DAY

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ABSTRACT
Gandhian Economic thought on Globalization can be traced from 'Hind Swaraj', a book written by Gandhiji. Globalization is a primary economic phenomenon that involves interaction or integration of national economic systems through the growth in international trade, investment and capital flows. There was a big expansion in world trade and investment in the late nineteenth century. Moral value was extremely important for Mahatma Gandhi. Economics without ethics and ethical consideration was not warranted. Gandhi insisted that the relationship between the economics and ethics works both ways. The wants control theory of Gandhi simultaneously solves the problem of consumerism and unsustainable resource use. On the Macroeconomics front too, Gandhiji clearly promoted decentralized production systems. He worked for whole lifetime on articulating the principles of an alternative and "more real" human economy.

INTRODUCTION

Gandhian Economic thought on Globalization and changing international scene can perhaps be traced to 'Hind Swaraj', a book that Gandhi wrote and published in 1909 in which Gandhi ji has mainly assessed the modernization of England and Europe and has anticipated ill effects of it on the Indian Society if the latter tried to follow the former blindly.

What Gandhi saw in England during his stay made deep impressions which was reflected in the book the Hind Swaraj. "Civilization seeks to increase bodily comforts, and it fails miserably even in doing so. The Civilization is irreligion, and it has taken such a hold on the people in England that those who are in it appear to be half mad. They lack real physical strength and courage. They keep up their energy by intoxication. They can hardly be happy in solitude. Women, who should be queens of households, wander in the streets, or they slave away in factories. For the sake of a pittance, half a million women in England alone are laboring under tiring circumstances in factories or similar institutions".

GLOBALIZATION

Globalization is a primary economic phenomenon involving the increasing interaction or integration of national economic systems through the growth in international trade, investment and capital flows. However, one can also point to a rapid increase in cross-border social, cultural and technological exchange as part of the phenomenon of globalization.

Perhaps Globalization started from the first great expansion of European capitalism that took place in the 16th century following the first circumnavigation of the earth in 1519 to 1521. Indian carried out international trade even before the Christian era began, that was also a kind of globalization.

There was a big expansion in world trade and investment in the late nineteenth century. The First World War and the both of anti-free trade protectionism that led to the Great Depression in 1930 brought this to a halt. Some see this period as an interruption to the process of globalization commenced in the late 19th century.

The end of the Second World War brought another great expansion of capitalism with the development of multinational companies interested in producing and selling in the domestic markets of nations around the world. The emancipation of colonies created a new world order. Air travel and the development of international communication enhanced the progress of international business. The fall of the Berlin Wall and the collapse of the Soviet Union ended the cold war between the forces of capitalism and socialism with capitalism became triumphant.

GHANDHI'S ETHICAL ECONOMICS

Moral value was extremely important for Mahatma Gandhi. Economics without ethics and ethical consideration was not warranted. Dasgupta (1996) in his comprehensive analysis on Gandhi's economic thought had dealt with the subject thoroughly. According to him, Gandhi's approach to economic issues was explicitly based on ethical considerations. Gandhi insisted that the relationship between the economics and ethics works both ways. While economic concepts were laden with ethical implications, ethics too, must descend from the clouds and become 'good economics'. Ethics, Gandhi said, was not simply an exercise for philosophers; it was a convenient handle for sharpening their wits on the logic of extremes. It must be relevant to the ordinary business of life where one's options are limited by resource constrains. Ethics by its nature is an enterprise for economic world, a guide to the perplexed and answers to the credibility.

ECONOMIC MAN AND SOCIETY

The economic man and the economic society are so defined that one always feels poor no matter how rich he or she is. The core of this contradiction lies in the consumption theory and not in the production theory. Marshall, the master creator of the consumption theory, had to say "Although it is man's wants in the earliest stages of his development that give rise to his activities yet afterwards each new step is to be regarded as the development of activities giving rise to new wants rather than of new wants giving rise to new activities"

Gandhi suggested a consumption pattern and behavior for the affording classes, which was to be moderated by ascetic and paternalistic values. Raval (1971) has termed this as 'Gandhi Effect'. The individual preference function has to be impacted by this. In positive economics there is no scope to introduce this constraint and then maximize utility. Income is the only constraint that is accepted.

DEMAND CONTROL THEORY OF GHANDHI

The paradigm shift has to be recognized. Now if we wish to understand Gandhi's basic premise for economics we will have to start with the treatment of wants. Why did Gandhi suggest control on needs? He did so because he did understand that human needs given the freedom of choice were insatiable (Diwan & Lutz 1985). The societal approach to accept this and then use the science and technology for need satisfaction was not a sustainable approach according to him.

Thus, the wants control theory of Gandhi simultaneously solves the problem of consumerism and unsustainable resource use. The ecological and environmental economics disciplines try to grapple with the equilibrium analysis by internalizing the ecological and environmental externalities, but Gandhian Economics

by regulating individual wants and demand functions has potential to regulate and control some of the externalities (Gandhi 1995).

GHANDHIAN VIEW OF MACROECONOMICS

On the Macroeconomics front too, Gandhiji was clearly promoting decentralized production systems. Village level self-sufficiency was nothing but providing maximum opportunity for production at local level. He preferred simple systems as against modern system that was complicated. Lakdawala (1971) assessment on this issue about Gandhi may be seen in the following expression, "Gandhiji instinctively disliked the working of the money opinion; transactions in kind were more easily understood and more human. The only types of banks he approved were in the nature of grain banks for safe local storage. Ordinary commercial banks associated with urbanization were a part of the mechanism of local exploitation". Market and its value system controlled by the state have failed miserably. Brahmanand (1971) Wage Good theory led to the same Market-State ideal combination that appeared to fail ultimately.

Looking back, one is amazed at the deep understanding of Mahatma Gandhi for each of the economic problems. He dealt with some problems more intensively than others but he never lost sight of any one of them. He denounced the concept of economic man because he refused to recognize the separation of economics from ethics. He denounced the technological determinism because it enslaved man and sanctified only those technologies that conformed to value promises. About all, he struggled against the mightiest imperial power in terms of non-violent theory and order. As he went along with these tasks, he discovered his own science of economics, although he did not analyze it in a very vigorous manner.

However, it is believed that the Gandhian approach was superior because its concepts lied in their in-built dynamics and close relations with implying on a Gandhian path, not only the system put on the path of steady growth, its moral legitimacy also does not remain in doubt any longer.

He was not interested in the scope and method of economic science, as the economists "naturally understand it". Rather, he worked for a whole lifetime on articulating the principles of an alternative and "more real" human economy centering on the very themes outlined in his lecture: "the lack of correlation between material expansion and genuine progress, the need for an economics-cum-ethics that will enable moral growth and dignity for all, the fallacy of seeking happiness in individual acquisitive behavior, and the need for encouraging people to seek a self-esteem and genuine meaning.

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General Article

BOKARO DISTRICT: "HISTORY OF INDUSTRIALISATION AND ITS INDUSTRIAL RESOURCES"

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Bokaro district is one of the most industrialized zones in India. It is one of the twenty-four districts of Jharkhand state. Jharkhand is very rich in mineral resources and Bokaro district stands out to be one of the most resourceful, among all the districts. The process of industrialization started with the advent of the British in East India in search of coal. Several minerals such as coal, limestone and quartz were found and thus the process of setting up industries began, looking at availability of resources in the state.

Presently, Bokaro has about 1600 industrial units out of which 1496 are registered. Due to presence of large no of PSU enterprises and private sector industries in Bokaro district, there has been tremendous scope of vendorization and ancilliarization of steel industry, cement, general engineering, chemical, ceramic, machine tools, electrical & electronics machineries, refractories etc.

Although development took place everywhere in the district by setting up of large industries, gigantic power houses and majestic mines yet there is huge scope of improvement in terms of infrastructure, technical education and social upliftment. Bokaro, as an industrial hub, is yet to see its golden era.

ABSTRACT

Bokaro District: An Introduction

Bokaro district is one of the most industrialized district in the state of Jharkhand and it can be only compared with the Ranchi district (State Capital), Dhanbad district (The coal capital of the State) and with the East Singhbhum district having the city of Jamshedpur (the industrial capital of the state).

Bokaro district was made on 1st April,1991 by carving out six blocks from erstwhile Giridih district and two blocks from Dhanbad district having a total area of 2860.83 sq.km and a total population of 20,61,918 (Census of India, 2011), lying between 23°24'17" and 23°59'12" North latitudes and between 85°35'00" and 86°29'15" East longitudes. Its maximum east-west length along the Damodar Valley is 102 km. and maximum width across Petarbar-Tenu Dam-cum-Kathara-Bokaro is 58 km. Bokaro district is situated on National Highway 23 and 125 km away from state's capital, Ranchi. The rivers like Damodar, Garga, Bokaro, Jamunia and Isri flow through the district (Jayswal 2004, http://en.wikipedia.org/wiki/Bokaro_district).

History of Industrialization in Bokaro District

History of industrialization in Bokaro region dates much before the independence of the country when the region fell under the districts of Giridih and Dhanbad. Actually, the discovery of huge coal reserves in the region during the early decades of last century attracted the British and they started coal mining in the region (http://archive.jharkhand.gov.in/new_depts/mines/geo/Profile.pdf**)**. As the production of coal in the district increased along with the increase in the power requirement of the collieries and

the people of the region, several Thermal and Hydel Power Plants were established year by year. Several coal-washeries were also setup in the district to supply washed coking-coal to the steel plants of the state and the country as well. In the year 1958, Indian Explosives Ltd. (I.E.L.) was established in Gomia Block and since then it has got international recognition. Likewise, a number of refractories including Bharat Refractories were also established in Bhandaridih near Phusro in Bermo block in 1972 (Jayswal 2004).

But real industrialization of the district geared up only after 1965, when Bokaro Steel Plant (BSP) came into existence. It was during the period of the 2nd Five Year Plan(1956-1961) in which the industrialization of the country was focused so that poverty of the nation could be eradicated through employment generation and by the proper use of natural resources of the country. While the D.P.R. of Bokaro Steel Plant had already been prepared in 1959, the plant was established in the year 1965 and its first blast furnace was commissioned on 2ndOctober, 1972 (Jayswal 2004, http://dcmsme.gov.in/dips/DIPS%20Bokaro.pdf).

After the establishment of B.S.P, Bokaro Industrial Area Development Authority (BIADA) was setup where 47 ancillary industries 138 small scale industries cropped up, gradually and steadily. Recently, a big Bottling Plant has been setup at Balidih (near Bokaro Steel City) in which coal-bed methane gas of Talgaria area produced by Oil & Natural Gas Commission (ONGC) will be used. A detergent making company, an ancillary of Hindustan Lever Ltd. has also been setup at Bahadurpur. A number of soft coke industries, coal bricket and slurry bricket industries are now running in the district. A cement factory is also established by Jaypee Group in Balidih Industrial Area.

In recent years (since 2001 to 2012), the Steel giants like Arcelor-Mittal showed their interests in setting up green field steel plant with a capacity of 12 million tons in the area around the Bokaro Steel City. They took 2500 acres of land at Peterbar-Kashmar just 20 km. from Bokaro Steel City near N.H.-23. Even Anil Ambani's Reliance Infrastructure have plans for Greenfield Steel Projects with a capacity of 12 million tons to be erected in Bokaro (on NH-23), near Damodar Bridge. Government of India has announced another new steel plant for Bokaro as part of joint venture with POSCO and SAIL that will use FINEX technology with capacity of 1.5 million tons in the peripheries of Bokaro Steel plant to be set up in an area of 500 acres. Bhushan steel has also acquired land for its steel plant with expected capacity of 3 million tons. DVC and SAIL has decided to establish a joint venture each having 50% shares to extend the power generation capacity of Bokaro Steel Plant from 500 MW to 1000 MW. ONGC has started exploring Coal bed methane gas in Parbhatpur (12 K.M. from Bokaro) for commercial use.

The Jharkhand Government has planned to setup its second SEZ after Jamshedpur, in BIADA in 500 acres of land. It has suggested availability of land in Balidih industrial area, where most of the ancillary units of Bokaro Steel Plant are situated.

With the industrialization gaining pace in the State, the Steel City of Bokaro is all set to figure in the commercial flight map soon. The Air Deccan, a private airline company, has initiated the process to launch its flights between Bokaro and Kolkata.

Industrial resources of Bokaro District

Some geographers don't consider industries as resource. Industries are users of the resources. The industries transform the raw materials for different utilization. Mankind has established a civilization where industrial production constitutes the items of his need. As a matter of fact, industries are considered here as resources of region determining

the economic status of that particular region, its people or country, as a whole (Jayswal 2004).

Table: Some major industrial establishments of Bokaro District:

NAME	LOCATION	YEAR OF COMMENCEMENT	CAPACITY
1.Bokaro Steel Ltd.	Bokaro Steel City	1972-First blast furnace started	4.5 Million tons liquid steel
2.Indian Explosive Ltd.	Gomia	1958	Capacity not publicized due to security reasons.
3.Bokaro Thermal Power Plant(Unit A & B)	Kathara (Gomia Block)	1960	175 MW
4.Chandrapura Thermal Power Plant(6 units)*	Chandrapura (Bermo Block)	1964-1979	750 MW
5.Tenughat Thermal Power Plant(2 units)	Lalpania (Gomia Block)	1971	420 MW
6.Kargali Coal Washery	Near Phusro (Bermo Block)	1958	5000 tons/day
7.Dugda Coal Washery (2 units)	Dugda (Bermo Block)	1962-1965	1530 tons/day
8.Kathara Coal Washery	Kathara (Gomia Block)	1967	8000 tons/day
9.Swang Coal Washery	Swang (Gomia Block)	1966	1300 tons/day
10.Bharat Refractories	Bhandaridih (near Phusro, Bermo Block)	1972	

*2 new units are being installed with total capacity of 500 MW.

Impacts of Industries and Industrialization

Industrialization always brings both boon and bane along with it. No doubt, rapid industrialization of the district has reduced the burden on agriculture with respect to employment. Industrialization has enhanced the per capita income as well as improved the standard of living of the people of the district. Urbanization followed industrialization, as a result of which only half of the district's population now lives in the rural areas.

Infrastructure boomed up with new railway lines, roads, educational institutes, shopping complexes, hospitals and several other basic facilities.

While the development could be seen everywhere, the ever increasing industries played foul with environment and surrounding of the district. The levels of the pollutants in the air and water bodies have increased at an alarming rate. Despite huge efforts by the

district administration, Bokaro ails with the problem of chronic pollution. The lifeline of the district, Damodar River, needs immediate attention (Jayswal 2004).

These problems require immediate and effective solutions which shall tone down the harms done by industries and make way for sustainable development.

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General Article

COMMERCIAL CULTIVATION OF VANILLA IN JHARKHAND

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ABSTRACT
Vanilla is the second most expensive spice traded in the international market after saffron. It is an orchid grown widely as a climber in the forests. In 1835 British introduced it to India. India ranks sixth in production of vanilla in the world. The crop is important for the Indian economy. Vanilla grows better in the areas having an annual rainfall of 150 to 300 cm and a temperature ranging between 25^0C to 32^0C. Loamy (sandy) and laterite (reddish) soils with plenty of organic matter and proper drainage are essential conditions for the proper growth. Agro-climatic condition of Jharkhand is almost similar to the agro-climatic condition required for vanilla cultivation. Therefore, vanilla cultivation may be adopted by farmers of Jharkhand to improve their economic condition. Altogether in 15 years, total investment in vanilla cultivation is Rs. 3601616 and net profit is Rs. 14644670 per hectare.

INTRODUCTION

Vanilla is the second most expensive spice traded in the international market after saffron. It is an orchid grown widely as a climber in the forests of South East Mexico, Gutemala and parts of Central America (Krishnamurthy et al. 2006). In 1835 British introduced it to India. East India Company started cultivation of vanilla in their spices garden in Tamil Nadu, West Bengal, Kerala, Pondicherry and Assam. The commercially important species are *Vanilla pompona, Vanilla plantifolia* and *Vanilla tahitensis*. Of these three species, *Vanilla planifolia* is the most popular and is cultivated for its pods (beans) which are subjected to curing process to produce the characteristic aroma Fig. 1 & 2).

The substance responsible for the unique fragrance and flavour of the vanilla beans is *Vanillin* ($C_8H_8O_3$). Vanilla today constitutes the world's most popular flavouring agent used in the manufacture of chocolates, ice creams, soft drinks, confectionary, candy, baked foods, puddings, cakes, cookies, liquors, etc. It is also used in perfumery and as a masking agent in pharmaceuticals. Therefore, the demand for natural vanillin is increasing in the world (George 2000, Sryanarayana 2004).

The global production of vanilla beans in 2001 was estimated at 5,598 tons from an area of 41,025 hectares. India ranks sixth in production of vanilla in the world with 60 million tons (2001). In India, Vanilla is cultivated in Karnataka, Kerala, Tamil Nadu, Lakshadweep, Andaman and Nicobar islands. Karnataka occupies the largest area (1465 ha) under vanilla cultivation in India, followed by Kerala (812 ha) and Tamil Nadu (268 ha). The crop has economic significance in the Indian economy and has significant demand in the international market. The income from the crop has increased by 10 per cent every year (Krishnamurthy and Melanta, 2002).

DESCRIPTION OF THE VANILLA CROP

Vanilla (*Vanilla plantifolia* Andrews or *Vanilla fragrans* Salisb.) is an herbaceous, perennial, climbing orchid belonging to the family Orchidaceae and order Orchidales. Vanilla is the only genus in the family Orchideacae to

produce edible fruits and is cultivated commercially. It is a perennial crop, starts yielding from third year after planting and continues to give commercial yield for 12 to 15 years.

Figure 1. Vanilla Flower

Figure 2. Vanilla Beans

AGRO-CLIMATIC CONDITION FOR VANILLA CULTIVATION

Vanilla grows better in the areas having an annual rainfall of 150 to 300 cm and a temperature ranging between 25^0C to 32^0C. Areas that receive rainfall for 8 to 9 months with dry climate for the remaining 3 to 4 months are ideal for growing vanilla. Loamy (sandy) and laterite (reddish) soils with plenty of organic matter and proper drainage are essential conditions for the proper growth.

Vanilla is mainly propagated through shoot cuttings. The vine starts flowering from third year onwards and economic yield starts from fourth year onwards. Flowering starts from December to April and peak flowering is found in April. The matured beans/pods are harvested during October – November. Highly humid atmosphere is required throughout the

year and particularly during the south west monsoon months of May to September (Suryanarayana 2004).

VANILLA AS A CROP IN JHARKHAND

Vanilla can be grown in the forest areas of Jharkhand where trees are sparsely present. It can also be grown under artificial shade provided by shade nets. Shade net houses constructed with stone pillars, provide 50 per cent shade and galvanized iron wire inserted in LDPE (Low density polypropylene ethylene) pipes tied between the pillars on which the vine is trained. Agro-climatic condition of Jharkhand is almost similar to the agro-climatic condition required for vanilla cultivation.

Vanilla does not require much water. It requires well drained soil having pH 6.0-6.5, rich in humus and organic matter. Fortunately, Jharkhand has suitable soil for cultivation of vanilla. Ideal time for its cultivation is May-June. The vine normally starts yielding from the third year after planting and the yield stabilize by the fifth year. It yields optimum for next 8-10 years.

Thus, it can be concluded that vanilla cultivation can improve the socio-economic condition of the people of Jharkhand.

CALCULATION FOR COST AND RETURN OF VANILLA CULTIVATION

Small farmers

The cash investment & income and profit/loss calculation is presented in Table 1. The net cash initial investment is Rs. (–) 1023308 per hectare. Expenditure for subsequent 15 years is shown in the table 1. Similarly, income and profit/loss calculation is also shown in the table. It is calculated that earning stats from third year. Altogether in 15 years, total investment is Rs. 36, 01,615.9 (36, 01,616) and total earnings is Rs. 1, 82, 46,286. Therefore, net profit is Rs. 1, 46, 44,670. Hence, it is a highly profitable for the farmers of Jharkhand.

Large farmers

Similar to the small farmers, cultivation of vanilla by large farmers is highly profitable as calculated in table 2.

Table 1. Investment Cost and Return calculation for Vanilla cultivation (Small farmers)

Year	Investment/ha (Rs.)	Income/ha (Rs.)	Profit/Loss (-)/ha (Rs.)
Initial Investment	1023308	00	-1023308
1	20894.2	00	-20894.2
2	76196.7	00	-76196.7
3	209874	448085	238211
4	218014	1090620	572606
5	223259	1771650	1548391
6	223259	1771650	1548391
7	223259	1771650	1548391
8	223259	1771650	1548391
9	223259	1771650	1548391
10	223259	1771650	1548391
11	192654	1526523	1333869
12	162547	1326541	1163994
13	132654	1235642	1102988
14	123564	1032652	909088
15	102356	956323	853967

Table 2. Investment Cost and Return calculation for Vanilla cultivation (Large farmers)

Year	Investment	Income	Profit/Loss (-)
Initial Investment	1001583.5	00	-1001583.5
1	19184	00	-19184
2	77672	00	-77672
3	202248.5	493010	290661.5
4	207964	1150440	942476
5	212617	1887600	1674988
6	212617	1887600	1674988
7	212617	1887600	1674988
8	212617	1887600	1674988
9	212617	1887600	1674988
10	212617	1795680	1583063
11	195682	1652310	1456628
12	163525	1426351	1262826
13	156321	1123651	967330
14	142635	1023561	880926
15	123626	982653	859127

PROBLEMS IN VANILLA CULTIVATION

The main problem faced by the small and large farmers are; occurrence of pest and disease, non-availability of skilled labour and high initial cost in pure crop plantation. The non-availability of skilled labour for pollination is the major problem in vanilla cultivation.

The high initial cost in pure crop plantation is the other problem faced by the farmers. The other problems faced by small and large farmers were non-availability of planting materials and non-availability of organic manure. Credit facility for farmers from banks is required for vanilla cultivation. Farmers should be given cultivation, processing, packaging and marketing training also.

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General Article

MICRO-PLANNING FOR RURAL TRANSFORMATION IN INDIA

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Abstract
The removal of poverty and development of the rural areas calls for a multi-dimensional action-oriented series of micro programmes. All the Five-Year Plans have given fairly high priority to the rural sector and indeed, a substantial outlay went to the development of the rural economy. But, however, our attack on rural poverty in the past did not meet with the desired success for want of an integrated approach. Therefore, any programme of rural development should take into account the realities and special features of the rural economy and ensure not only coordination between different sections of the programme but a perfect integration and interaction between them.
In India, the Next Five Year Plan and other future plans of action must give priority importance to the implementation aspect of the plans and programmes at the micro-level and look into the achievements through annual monitoring and evaluation, otherwise, like all the successive Plans operated, the proposed schemes and programmes for the development of the rural areas under micro-level planning approach would remain merely a 'charter of intentions'. Therefore, if the multi-dimensional micro-level planning approach is designed in this way and implemented with the help of facilities like economic, political and environmental; involving the people at large, it would go a long way in transforming the rural scene and eradicating the area or regional disparities in the country.

Introduction

The process of planned economic development was initiated in India after independence, particularly with the advent of the First Five Year Plan in 1951 intending to expand the community's productive power, to provide the environment in which the benefits of economic development could accrue more and more to the relatively less privileged classes of society and to reduce progressively the concentration of incomes, wealth and economic power. Planning, as conceived in India, during the past 65 years, has largely been concerned with the formulation of public policy for maximizing national income focusing attention primarily on the choice of criterion for optimum resource allocation between different sectors of the economy. The analysis has mostly been in terms of macro-level aggregative sectoral projections neglecting the spatial planning framework, inter-sectoral co-ordination and functional inter-linkages which have led to environmental pollution, social disintegration, sectoral and spatial imbalances and mass poverty in the country. The two main causes of poverty in India are under-development and inequality which are extensively prevalent in rural areas. The removal of poverty and development of the rural areas calls for a multi-dimensional action-oriented series of micro programmes (Agrawal 1976). All the Five-Year Plans have given fairly high priority to the rural sector and indeed, a

substantial outlay went to the development of the rural economy. But, however, our attack on rural poverty in the past did not meet with the desired success for want of an integrated approach. Therefore, any programme of rural development should take into account the realities and special features of the rural economy and ensure not only coordination between different sections of the programme but a perfect integration and interaction between them. This paper provides a brief overview of the fact that merely disowning the names of any '*yojna'* or merely introducing each year a new '*yojna'* would create only political chaos. On the other day, after today, when the govt. would become any erstwhile govt. the replacing govt. would again make political corrections, the process of vicious-circle of making corrections would go on endlessly. These are the tragic inactions of the govt. which the rural poor have to pay its price. Noting that many of the problems of the poor economy can be understood under the framework loosely based on prisoner's dilemma in game theory. The paper examines five, aspects of planning in terms of its contribution for resolving prisoner's dilemma problems. These are –

1. Systematic thinking for the development of the weaker sections in India took place in the beginning of the '*third five year plan'- to evaluate.*
2. It was in 1999, emphasis was laid on providing more employment opportunities to the rural mass through self help group agencies- *to examine.*
3. Regional planning or Area-Based-planning would foster the possibilities of development environment in India- *to accelerate.*
4. The operational part of this approach is derived from the assumption that there exists over population and consequently, a reserve army of labour in agriculture- *to optimize.*
5. There has been a flaw in the overall design of the development strategies being pursued hither to or that the implicate discipline of microeconomic planning has been lacking**.**

Conceptualization of Constraints

The government has introduced various schemes meant for boosting up agricultural production during the last six and half decades (Fourie and Van 1947). The Intensive Area Development Programme which has been introduced in some of the selected districts aimed at intensifying the agricultural operations through the extension of farm technology and the dissemination of the knowledge of modern farming. But, the beneficiaries are usually the big and medium farmers only. To break the bottle-necks in the development process on the side of credit availability, after realizing the reluctance of organized banking system to venture into agricultural financing, much hope was pinned on the co-operative. But the co-operative movement has done perhaps a very little to ameliorate the economic conditions of the marginal and small farmers. A large portion of rural unemployed can be gainfully employed through rational distribution of land, provision of required inputs, promotion of subsidiary occupations and provision of credit facilities. Our lop-sided economic development is the main cause of the rapid rise in unemployment and under-employment in rural areas. The development strategy, hitherto followed, has caused concentration of investment in urban areas and also concentration of economic power in fewer hands. Presently, agriculture and industry exist as almost two unrelated activities. Agriculture being unorganized and backward, does not offer expanding markets for growing industry. At the same time, anemic agriculture cannot sustain industrial growth. Industrial development has a definite role to play in

the solution of the problem of over-population and under-employment and unemployment in the rural areas. Cottage and small industries in the village is next to that of agriculture (Planning Commission Report 1969). Similarly all the successive Five Year Plans gave priority importance to small and cottage industries to be located and flourished in rural areas but due to the defective approach and lack of spatial dimensions in planning exercises, industries in the rural areas have not provided expected employment opportunities.

The role of rural industries may not be restricted to supplementing the agricultural occupation only. Industrial growth should be conceived more as a tool for drawing out the under-employed agricultural labour and increasing productivity in general. Also, village industries should not be equated with perpetuation of inferior production techniques, rather important tools and equipment have to be introduced to the village craftsmen if they are to compete successfully in open markets. It is equally necessary to accelerate the process of decentralization of industrial growth because an underdeveloped economy like ours needs a pyramidal structure of industries for a stable and balanced development. The base of the pyramid consists of the innumerable small industries of various descriptions located in the rural areas.

Transformation of Associated Problems

Development in the agricultural or the industrial sectors as well as optimum utilization of surplus man power can be assured only by planning the different economic aspects of a particular area based on its own resources and skills which has generally been overlooked in the highly centralized sectoral type of planning in India (Levis 1966). All the villages cannot be developed simultaneously and independently nor, all are suited for industrial development. At the same time, the village is too small a planning unit for building the services and institutions needed for agriculture. Yet, there are a large number of big villages which could promote linkages with urban areas emanating a 'viable rural-urban community' designed to stress the idea that as agriculture modernizes and new agro-industries and agro-services emerge, there will be increasing interdependence of village and town development.

Therefore, village-cum-town development linking clusters of villages with the growth centre or focal points should form the basis of the area planning for developing the countryside (Merrium 1963). Growth centers should be provided with the needed infrastructural facilities including economic and social institutions to supply agricultural and industrial inputs, shops for consumer goods, marketing and warehousing facilities, agro-industries, health, educational, recreational and credit facilities of many kinds. The highest importance should be placed on the establishment of credit institutions and industrial co-operatives at the growth centers.

Rural development and employment promotion do not need so much of reiteration as effective implementation of the various schemes. In the past, the desired results of rural development promotion could not be achieved not because of the paucity of schemes. Rather, there were schemes after schemes. What wanted were the techno-economically feasible schemes and their effective implementation. Therefore, even if we have only a few schemes, it would be better to implement them fully.

Conclusion

Thus, to conclude, the need in India, particularly for rural transformation, is to adopt multi-dimensional micro-level planning covering all the aspects of the rural economy. This is because; only such type of planning strategy will induce functional integration among the schemes, and sectoral co-ordination at

different hierarchical levels of planning and ensure people's participation on a mass scale (Metraux 1954). Such type of planning strategy, by means of focusing attention on all the aspects of the rural economy and making a frontal attack on the problems, will increase productivity, provide adequate employment opportunities and secure decentralization of economic power and wealth through equitable distribution of the fruits of development which in turn, would be conducive to rural transformation from the state of stagnation, poverty, unemployment and inequality to progress, prosperity, self-employment and equality.

At the same time, in the absence of effective implementation machinery, adequate infrastructural facilities, improved agricultural technology, supply of agricultural inputs and agricultural extension, agricultural marketing and processing, supply of industrial raw materials and intermediate products to the rural areas as a base for establishing manufacturing finished goods industries, availability of minimum level of developmental services, credit facilities easily and at moderate cost and above all political will and people's participation, such type of micro-planning may fail in achieving the goal of integrated rural development and transformation of the rural scene (Mishra et al. 1974, Musi 1971). For the successful implementation of the plan and programmes there should be an integrated organizational and institutional structure as well as necessary authority within the district or regional plan, as the case may be, co-coordinating the developmental programmes of all the hierarchies of the functional settlements (Mydral 1968). There should be only one agency responsible for all development programmes in the micro-level plan operating within the region.

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HEATING MECHANISM OF MICROWAVE

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ABSRACT
Conduction and dipolar polarization may both give rise to heating under microwave irradiation. Microwave heating is quite distinct from microwave spectroscopy. The photon of a quantum phenomenon excites the rotation levels of gas phase molecules while the absorption of microwave in solid and liquid samples is frequency dependent. The phase difference causes energy to be lost from the dipole in random collision and to give rise to dielectric heating. Heating in metals and metal powders depends heavily upon conduction losses. Magnetic polarization may also contribute to the heating effect.

INTRODUCTION

It has long been known that materials may be heated with the use of high frequency electromagnetic waves (Williams 1967). The heating effect arises from the interaction of the electric field component of the wave with charged particles in the material. Two major effects are responsible for the heating which results from this interaction. If the charged particles are free to travel through the material (electrons in a sample of carbon, for example), a current will be induced which will travel in phase with the field. If, on the other hand, the charged particles are bound within regions of the material, the electric field component will cause them to move until opposing forces balance the electric force. The result is a dipolar polarization in the material. Conduction and dipolar polarization may both give rise to heating under microwave irradiation, and are discussed in more detail below.

It is important to note that microwave heating is quite distinct from microwave spectroscopy. The latter is a quantum phenomenon in which photons of particular energies (and therefore frequencies) excite the rotation levels of gas phase molecules. Whilst the absorption of microwaves in solid and liquid samples is frequency dependent, it is by no means quantized and does not depend upon the direct absorption of microwave photons. Rather, the material behaves as though reacting to a high frequency electric field, and so may be subjected to classical analysis (Daniels 1967, Hill et al. 1969, Hasted 1973, Frohlich 1958, Debye 1929). Details of this analysis are beyond the scope of this introduction, although some of its chemically significant aspects will be introduced and discussed in the following sections.

Dielectric Polarization:

The inability of partially bound charges to follow the rapid changes in a high frequency electric field gives rise to one mechanism of microwave heating. The total polarization **(a_t)** of the material arising from the displacement of charges may be expressed as the sum of a number of components

$$\mathbf{a_t = a_e + a_a + a_d = a_i}$$

Where $\mathbf{a_e}$ results from the displacement of electron charges in relation to the nuclei in a material, and $\mathbf{a_a}$ from the displacement of nuclei relative to one another in materials with unequal charge distributions. Polarization of both $\mathbf{a_e}$ and $\mathbf{a_a}$ operates on timescales which are very much smaller than that required for microwave frequency field reversals, and therefore follow microwave frequency fields almost exactly. As such they do not contribute to the microwave heating effect.

The complex dielectric constant, **ε*,** completely describes the dielectric properties of homogeneous materials and is expressed as the sum of real and complex dielectric constants:

$$\varepsilon^* = \varepsilon' + i\varepsilon''$$

The real part of **ε*, ε',** represents the ability of a material to be polarized by an external electric field. At very high and very low frequencies, and with static fields **ε'** will equal the total dielectric constant of the material. Where electromagnetic energy is converted to heat by the material, **ε''** is non-zero, and quantifies the efficiency with which the electromagnetic energy is converted to heat.

A further quantity, the loss angle **δ,** is also commonly used in the literature, and is more usually given in the form of its tangent. It is related to the complex dielectric constant by; $\tan \delta = \varepsilon''/\varepsilon'$

Where angle δ is the phase difference between the electric field and the polarization of the material.

Magnetic polarization may also contribute to the heating effect observed in materials where magnetic properties exist, and similar expressions for the complex permeability of such materials may be formulated.

Dipolar Polarization

Dipolar polarization is the phenomenon responsible for the majority of microwave heating effects observed in solvent systems. In substances such as water, the different electro negativities of individual atoms results in the existence of a permanent electric dipole on the molecule. The dipole is sensitive to external electric fields, and will attempt to align with them by rotation, the energy for this rotation being provided by the field. This realignment is rapid for a free molecule, but in liquids instantaneous alignment is prohibited by the presence of other molecules. A limit is therefore placed on the ability of the dipole to respond to a field, which affects the behaviour of the molecule with different frequencies of electric field.

When the dipole reorientates to align itself with the field, the field is already changing, and a phase difference exists between the orientation of the field and that of the dipole. This phase difference causes energy to be lost from the dipole in random collisions, and to give rise to dielectric heating.

In his theoretical expressions for **ε'** and **ε''** in terms of other material properties, Debye (Debye 1929, Whittaker 1997, Debye 1935) formed the basis for our current understanding of dielectrics.

The dielectric constants, **ε'** and **ε''** are dependent on both frequency and temperature, the first of which is expressed explicitly in the Debye equations whilst temperature is introduced indirectly though other variables;

$$\varepsilon' = \varepsilon_\infty + \frac{(\varepsilon_s - \varepsilon_\infty)}{(1 + \omega^2\tau^2)}$$

$$\varepsilon'' = \frac{(\varepsilon_s - \varepsilon_\infty)\omega\tau}{(1+\omega^2\tau^2)}$$

Where ε^* and ε_s are dielectric constants under high frequency and static fields respectively. Since infra-red frequencies are often regarded as infinite for most purposes, ε^* results from atomic and electronic polarizations, whilst ε_s results from the sum of all the polarization mechanisms described in a later section. The relaxation time, [tau], was derived by Debye from Stoke's theorem;

$$\tau = \frac{4\pi\eta r^3}{\kappa T}$$

Where **r** is the molecular radius, η the viscosity, **K** Boltzman's constant, and **T** the temperature.

In solids, the molecular dipoles are no longer free to rotate as they are in liquids, but are restricted to a number of equilibrium positions, separated by potential barriers. Theoretical treatments of this behavior have been formulated and are similar to those developed for liquids. The simplest model for this behavior assumes that there are two potential wells separated by a potential barrier of energy W. This represents the two possible orientations of the dipole. Through statistical mechanics, it is found that the relaxation time is related to the potential barrier by

$$\tau = Ae^{-W/kT}$$

where A is a temperature dependent constant. In fact, most dipolar solids exhibit extremely small dielectric losses since W tends to be extremely large. Water-free ice, for example does not heat significantly under microwave irradiation.

Conduction Effects

In addition to the dielectric losses describe above, many materials may also shown losses through conduction under microwave irradiation. The complex dielectric constant may be expressed to take account of these losses by including a separate conduction term:

$$\varepsilon^* = \varepsilon'_\infty + \frac{\varepsilon'_s - \varepsilon'_\infty}{1+i\omega\tau} - \frac{i\sigma}{\omega\varepsilon'_s}$$

The importance of this term is displayed by a large number of systems. The addition of dissolved salts in water markedly affects the dielectric properties as conduction increases, and may become important enough to swamp the dielectric losses. On the other hand, the dielectric losses of the majority of solids arise predominantly from these conduction terms, and may be strongly affected by temperature.

The increase in the dielectric properties with temperature is especially important in the microwave heating of solids, as it introduces the phenomenon of thermal runaway. Microwave heating in alumina is poor at room temperature, and dT/dt is therefore small. As the temperature increases so too does the dielectric loss factor and heating becomes more effective (Hamon 1953, Kenkre et al. 1991) and dT/dt increases rapidly. Without careful monitoring of these materials under microwave irradiation, their temperature may rise to undesirably high levels.

Heating in metals and metal powders depends heavily upon conduction losses (Chaudhary et al. 1999) and the important aspects of this phenomenon is treated in greater depth elsewhere.

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