handweeding treatment. Correspondingly the chemical treatment gave lesser number of pegs and immature pods at harvest than the hand weeded check in both the varieties. The herbicide treatments gave higher pod yield than both the control treatments. For instance, the imazethapyr at 0.20 kg ha^{-1} gave a pod yield of 1342 and 1612 kg ha^{-1} in CO 1 and CO 2 in the hand weeded check. This increased yield was brought about by higher shelling per cent, 100 kernel weight and more number of mature pods.

With the better control on the weed growth the crop could have effectively utilized available water, nutrient, light and space this possibly would have lead to more growth and yield than the traditional methods of weeding where considerable amount of nutrients and water is taken by the competing weeds. Among the several treatments imazethapyr gave higher with effective control of weed growth.

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STUDIES ON CHLOROPHYLL, NODULATION, NITROGEN FIXATION, SOYBEAN YIELD AND THEIR CORRELATIONS AS INFLUENCED BY MICRONUTRIENTS.

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ABSTRACT

A pot culture experiment results revealed that application of $FeSo_4$; $ZnSO_4$ treatments showed beneficial effects on chlorophyll content of soybean leaves, nodulation, dry weight of nodules/plant, grain and dry matter yield/plant as compared to control and treatments of $CuSO_4$ and $MnSO_4$ in both soybean varieties. Cholorophyll content, number of nodules/plant, fresh and dry weight of nodules/plant at 50% flowering as well as pod formation stage indicated positive correlation with seed and dry matter yield/plant. The characters showing positive association with yield/plant were also associated amongst themselves except nitrogen in nodules at pod formation stage.

The soybean (*Glycine max.* L.) a popular crop is cultivated throughout the world. It is one of the important protective food crop for meeting high demand of protien and oil. So soybean is introduced and intensive efforts are being made to popularise it with view to reduce the shortage of edible oil in India. But basic information on the influence of various micronutrients on chlorophyll content, nodulation, nitrogen fixation as well as correlations among the various characters are inadequte in soybean crop. Hence a study was made on chlorophyll content, nodulation, nitrogen fixation, soybean yield and their correlations as influenced by various micronutrients.

MATERIALS AND METHODS

A pot culture experiement was conducted during the summer of 1992 to study on chlorophyll content, nodulation, nitrogen fixation, soybean yield and their correlation as influenced by micronutrients. Soil was sterilized by autoclaving for 2 hours having pH 7.8., E.C. = 0.39 mmhos/Cm^2, Organic Carbon = 0.56%, Total nitrogen - 0.054%. Soybean seed Cv. MACS-57 and MACS-13 were inoculated with an efficient culture of *Bradyrhizobium Japonicum* . Treatments consisted of the soil application of M_1 = $FeSO_4$, M_2 = $ZnSO_4$, M_3 = $CuSO_4$ and M_4 = $MnSO_4$ @ 25 kg/ha and two soybean cultivars viz. V_1 - MACS-57 and V_2 -MACS-13 were used in combination indicated below:

1) V_1	6) V_2
2) $V_1 M_1$	7) $V_2 M_1$
3) $V_1 M_2$	8) $V_2 M_2$
4) $V_1 M_3$	9) $V_2 M_3$
5) $V_1 M_4$	10) $V_2 M_4$

The basal dose of nitrogen and phosphorus was 20:40 kg/ha. The design of the experiment was a factorial randomised block design with three replications. The total chlorophyll content of 3rd, 4th, 5th and 6th leaf, nodulation/plant; nitrogen content of nodules, dry weight of nodules as well as fresh weight of nodules/plant were recorded at the time of 50% flowering and pod formation stage. The total chlorophyll content of leaves was determined by using 80% acetone extractant (Arnon 1949). The nitrogen content was estimated by microKjedhal Method. (A.O.A.C. 1975). Simple correlation coefficient was computed among various characters as well as with seed and dry matter yield/plant.

REUSLTS AND DISCUSSION

The data regarding total chlorophyll content, number of nodules/plant, dry weight of nodules/plant, nitrogen percent in nodules of both stages and grain and dry matter yield/plant at harvest were presented in Table 1. It is evident from table 1, that the application of $FeSO_4$ and $ZnSO_4$ treatments have increased total chlorophyll content of leaves, number of nodules/plant, and nitrogen content of nodules as compared to control and treatments of $CuSO_4$ and $MnSO_4$ in both the varieties. The variety MACS-57 has shown higher values of total chlorophyll content of leaves as compared to MACS-13 in all treatments at 50% flowring as well as pod formation stage. The highest per cent of total chlorophyll content was 15.05 in MACS-57 + $FeSO_4$ treatment followed by 8.84 in MACS-57 + $ZnSO_4$ treatment at flowering stage.Kanwar et al (1969) reported that Iron was maximum and Zinc came next and none of micronutrients viz. copper, manganese, boron had significant beneficial effects as compared to control.

The data revealed that total chlorophyll content of leaves, and dry matter weight of nodules/plant, number of nodules/plant, nitrogen per cent of nodules indicated positive correlation with seed and dry matter yield/plant at 50% flowering stage seperately.(Table 2) The values of correlation co-efficient of total chlorophyll content of leaves, number of nodules/plant, dry matter weight of nodules/plant and nitrogen per cent in nodules with seed yield were + 0.94, + 0.834, + 0.864 and + 0.900 respectively at 50% flowering stage. The highest positive and significant correlation (+ 0.918) was noted between number of nodules/plant and dry weight of nodules/plant. Similar results have been recorded on the association of number of nodules and dry weight of nodules with each other (Singh 1971). The nitorgen per cent in nodules was also found to be more closely associsated with total

Table 1. Effect of different micronutrients on chlorophyll content and nodulation in soybean.

Treatments	Chlorophyll (mg/100g)		No. of nodules per Plant		Fresh Wt. nodule / plant (g)		Dry wt. of nodule / plant (g)		% N of nodule		At harvest	
	A	B	A	B	A	B	A	B	A	B	Grain yield / plant (g)	dry matter yield / plant (g)
V_1	118.08	116.10	50	36	0.970	0.560	0.320	0.190	1.08	0.923	2.500	1.670
V_1M_1	135.86	134.66	78	5	1.880	1.070	0.600	0.380	1.45	1.300	5.010	3.130
V_1M_2	128.53	124.70	77	52	1.760	0.850	0.570	0.320	1.28	1.123	4.410	3.130
V_1M_3	120.66	120.16	55	38	1.260	0.770	0.420	0.270	1.23	1.016	4.230	2.210
V_1M_4	119.88	118.62	51	36	1.220	0.790	0.370	0.280	1.20	0.966	4.030	2.130
V_2	112.23	112.06	45	31	0.880	0.540	0.310	0.190	1.06	0.920	2.300	1.470
V_2M_1	124.25	121.79	65	50	1.590	0.970	0.520	0.360	1.21	0.970	4.010	2.030
V_2M_2	123.08	118.00	63	48	1.540	0.910	0.480	0.331	1.16	0.916	4.000	1.960
V_2M_3	115.28	114.30	46	31	1.150	0.900	0.360	0.330	1.13	0.900	4.000	1.770
V_2M_4	114.65	114.20	49	31	1.130	0.770	0.350	0.290	1.02	0.890	3.000	1.680
S.E±	1.1314	0.8998	0.60	0.35	0.010	0.008	0.010	0.010	0.234	0.0141	0.4991	0.0141
CD at 5%	3.6661	2.6731	1.80	1.04	0.040	0.022	0.300	0.024	0.0695	0.0420	1.4820	0.0420

A = Flowering Stage B = Pod formation stage.

Table 2. Correlation co-efficient among the various characters at two growth phases of soybean as influenced by micronutrient.

Characters	At 50% flowering stage				At Harvest		At pod formation Stage				At Harvest	
	Total Chlorophyll (mg/100g)	No. of nodule / plant	Dry Wt. of nodules / plant (g)	Nitrogen in nodule (%)	Grain yield / plant (g)	Dry matter yield / plant (g)	Total Chlorophyll content /plant (mg/100 g)	No. of nodules / plant	Dry wt. of nodules (g)	Nitrogen in nodules (%)	Grain yield / plant (g)	Dry matter yield / plant (g)
Total Chlorophyll content (mg/100 g)	+1.00	+0.870**	+0.898**	+0.882**	+0.914**	+0.900**	+1.00	+0.895**	+0.930**	+0.378	+0.722**	+0.763*
Number of nodules / plant		+1.00	+0.918**	+0.831**	+0.834**	+0.910**		+1.00	+0.932**	+0.612	0.610	0.945**
Dry weight of nodules / plant (g)			+1.00	+0.851**	+0.868**	+0.896**			+1.00	+0.480	0.722*	0.820**
Nitrogen in nodules (%)				+1.00	+0.900**	+0.960**				+1.00	0.188	0.648*
Grain yield / plant (g)					+1.00	+0.911**					1.00	0.423
Dry matter yield / plant (g)						1.00						1.00

P = 0.05 (*) and P = 0.01 (**), respectively.

chlorophyll content of leaves (+ 0.882). Similar correlation of nitrogen per cent of nodules and total chlorophyll content of leaves were observed by Sudagar Singh and Ghai(1984). The significant and positive correlations were also observed among total chlorophyll content and final seed yield and dry matter yield/plant.William et. al. (1987) also reported that total chlorophyll content obtained in the third trifoliate leaf stage correlated well with final seed yield.

The values of correlations co-efficient at pod formation stage showed positive and significant correlation among various characters. However, the correlation values of nitrogen per cent of nodules failed to show significant correlation with total chlorophyll content of leaves, number of nodules/plant, dry weight of nodules/plant.

From the above discussion, it has become evident that application of $FeSO_4$, $ZnSO_4$ showed staistically significant and benefical effect on chlorophyll content of soybean leaves, number of nodules/plant and dry weight of nodules/plant as well as on seed and dry matter yield/plant in both soybean varieties. The extent of which depended upon the type of micronutrient and soybean variety for which it was applied. In correlation studies, it was noted that characters viz. total chlorophyll content of leaves, number of nodules/plant at 50% flowering as well as pod formation stage showed positive correlations with seed and dry matter yield/plant at harvest stage. The said characters were also correlated among themselves except nitrogen per cent of nodules at pod formation stage. Thus degree of correlation studies among various characters and with seed yield provided information on yield component characters and indicated their efficacy involving highest yield of soybean varieties under various micronutrient treatments.

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ENERGY USE IN CROP PRODUCTION SYSTEM IN TWO DIFFERENT FARM SITUATIONS - A CASE STUDY

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ABSTRACT

A study was conducted in Ikkaraiboluvampatty village to get an accurate insight into the crop production system. A total number of 15 respondents practicing traditional farm technologies and 15 respondents practicing innovative farm technologies were selected and their energy use pattern assessed. Sorghum crop was considered as a representative crop. On an average the traditional farms utilised 8103.80 MJ/ha and the mechanised farms 10246.00 MJ/ha. The energy imput ratios for both traditional and mechanised farms were 13.23 and 23.78, respectivelly. Thus the energy use efficiency was higher in mechanised farms as compared to traditional farms. Eventhough the input energy was high in mechanised farms, their corresponding increase in output energy showed the relative performance of factor inputs.

Energy is one of the most important critical factor inputs directly contributing to the productivity of land. Ariculture is both a producer and a consumer of energy. Agriculture consumes approximately 3.5% of the total energy, of which 2.9% is used by developed countries and 0.6% by developing countries. During the last few decades improved farm implements have been used as an alternate energy input in crop production system in order to speed up the timeliness of farm operations and improve farm efficiency and to realise the maximum net revenue in agricultural operations. A systematic analysis of the problems of energy requirements of different activities of agricultural sector will provide suitable policy options for implementations.

The basic objectives of the study were (a) to get an accurate insight into the crop production system in terms of their energy use and (b) to analyse the energy input use for suggesting suitable options for implementation at farm level.

METHODOLOGY

A total number of 30 farm families (15 respondents practicing age old farm technologies) were selected by random sampling proceedure in Thondamuthur block, Coimbatore district. Information relating to the type of implements used for soil and moisture conservation and the consequent changes in the adoption of innovative technologies were collected. Throughout this paper the standard international unit Joules was used to express the energy consumption level.

RESULTS AND DISCUSSION

The present study evaluates the energy input and output, and the improvement in monetary return due to the use of improved farm tools and implements. The primary concern of the study is to estimate the energetics of sorghum crop, taking into account the inputs like seeds, fertilisers, chemicals and various farm operations carried out by traditional and innovative farms. The study quantified and estimated the energy use pattern in traditional farms and in farms using soil and moisutre conservation energy gadgets like basin lister and wide bed former cum seed drills. For computing the equivalent energy of different inputs and energy sources the energy co-efficients as suggested by Mittal and Dawan (1985) were used.

Levels of energy use

To calculate the energy input use in crop production system, rainfed sorghum was chosen as a representative dry land crop. The energy use pattern for various farm operations for sorghum