showed signficantly higher 1000-grain weight than those of high and medium temperature regimes. Plants under high and medium temperature regimes had similer grain weight.

The grain yield per plant in the control was significantly higher than those of the treatments. High temperature resulted in the lowest yield per plant. This low grain yield was associated with reduction in percentage of filled spikelets per panicle and 1000- grain weight. The results of the present study support the earlier contention of Yoshida *et al.* (1981) that the rice plant is most sensitive to high temperature at flowering and high temperature during anthesis increases spikelet sterility. And also, warmer nights enhances respiration losses which could further intensify the spikelet sterility (Yoshida, 1972). The reduction in 1000-grain weight under high temperature regime in the present study could be attributed to low photosynthesis at 37°C day temperature accompanied by increased respiration losses due to high temperature (27°C) during night. However, the reduction in photosynthesis at low (23°C) day temperature could not be compensated even by the simultaneous decrease in respiration losses at low (20°C) night temparature and thus might be resulting in high spikelet sterility under low temperature regime in the present study.

Experiment 2: The unshaded plants gave significantly higher grain yield than those of shaded once (Table 2). Shading at 40 and 60% did not show any significant difference in grain yield. The principal yield component to be affected by increasing shading intensity was percentage filled spikelets whereas 1000-grain weight remained unaffected. It appears that solar radiations affect grain filling and hence filled grains by controlling source activity (Ayyangar *et al*,1977).

Considering the results of the two experiments, it seems that variation in temperature has considerable effects on grain yield and the reduction could be as high as 50% when the temperature is high during flowering and it appreciably influences grain filling percentage and grain weight. However, the reduction in solar radiations up to 60% during flowering and anthesis has less pronounced effect ie, 21.4% yield reduction and affects only grain filling. It is, therefore, infered that extreme variation in temperature during flowering and ripening phases is more detrimental to rice grain yield than low light intensity.

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INFLUENCE OF SEED TREATMENTS AND FERTILIZER LEVELS ON GROWTH AND YIELD OF RAINFED REDGRAM

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ABSTRACT

A field experiment was conducted at the Agricultural college and Research Institute, Madurai during Kharif season of 1984 to study the influence of seed treatments with Rhizobium and superphosphate along with soil and foliar fertilization of N and P on redgram CV Co.4 under rainfed condition in sandy clay loam type of soil. The results revealed that basal application of 6.25 kg N and 12.5 kg P_2O_5 followed by foliar spray of three per cent diammonium phosphate recorded higher plant height number of branches, leaf area index, dry matter production and seed yield, where as the seed treatment with Rhizobium and super phosphate had influenced only on dry matter production and seed yield of redgram.

Table 1. Effect of treatments on plant height (gm) and leaf area index at different stages of crop growth.

Treatments	Plant height (cm)				Leaf Area Index			
	45 DAS	75 DAS	105 DAS	135 DAS	45 DAS	75 DAS	105 DAS	135 DAS
S_0	50.4	108.2	141.2	145.3	0.072	1.205	2.908	2.628
S_1	51.5	110.3	142.6	145.6	0.074	1.257	3.071	2.751
S_2	51.6	109.4	142.0	145.0	0.073	1.234	3.030	2.670
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
F_0	43.5	94.8	124.5	129.6	0.061	0.977	2.368	2.032
F_1	58.3	116.5	146.7	150.4	0.081	1.422	2.930	2.619
F_2	51.0	110.8	144.4	147.1	0.074	1.231	3.128	2.742
F_3	51.1	109.2	144.9	147.8	0.074	1.222	3.043	2.731
F_4	51.3	112.3	145.3	148.3	0.076	1.248	3.248	2.966
F_5	51.7	112.3	145.8	149.5	0.073	1.292	3.302	3.008
CD at 5%	2.1	3.9	4.5	4.6	0.004	0.075	0.215	0.230

Redgram (*Cajanus Cajan* L.) a grain legume noted for its apetising flavour and acceptable taste with quality protein, occupies sixth position in the total world production of grain legumes and in India, it is second important pulse. Pulse crops, in symbiotic association with Rhizobium species in their root nodules fix up the atmospheric nitrogen and improve the soil fertility. However, for obtaining good yield a starter dose of N and P are considered essential (Katiyar, 1985). Seed treatment with plant nutrients and foliar fertilization of N and P were reported to the efficient in increasing the production in some of the pulse crops. Half soil and half foliar application of DAP was reported to be superior over full soil application in chickpea (Pathak et al, 1985). The major constraint for the low yield in redgram is that, it is less responsible to fertilizer under rainfed condition. Hence this present investigation was undertaken to study the influence of soil and foliar fertilisation, of N and P along with seed treatments with rhizobial culture and superphosphate on growth and yield of redgram under rainfed situation.

MATERIALS AND METHODS

A field experiment was conducted during Kharif season of 1984 at the Agricultural College, Madurai with redgram Co.4 under rainfed situation. The soil was sandy clay loam in texture containing low organic carbon (0.43%) available N (242 kg/ha), medium available P_2O_5 (16.8 kg/ha) and available K_2O (292.7 kg/ha) The treatments comprised combination of three methods of seed treatment and six fertilizer levels.

Seed Treatments :

SO : No seed treatment

S1 : Rhizobium (CCI) seed inoculation

S2 : Seed treatment with superphosphate (12% w/w)

Fertilizer Levels:

FO : No fertilizer application

F1 : Basal application of 12.5 kg N and 25 kg P_2O_5/ha

F2 : 6.25 kg N and 12.5 kg P_2O_5/ha basal + urea foliar spray to supply 3.24 kg N

F3 : 6.25 kg N and 12.5 kg P_2O_5/ha basal + superphosphate foliar spray to supply 8.28 kg P_2O_5

F4 : 6.25 kg N and 12.5 kg P_2O_5/ha basal + urea and superphosphate foliar spray to supply 3.24 kg N and 8.28 kg P_2O_5/ha.

F5 : 6.25 kg N and 12.5 kg P_2O_5/ha basal and diammonium phosphate (3%) foliar spray to supply 3.24kg N and 8.28 kg P_2O_5/ha.

The experiment was laid out in a randomised block design with three replications. Seed treatments with specific strain Rhizobium (CC1) and superphosphate (12% w/w) and basal application of N and P were done just before sowing. Foliar application of N and P was done in the morning hours at 70 DAS. Urea spary solution was prepared by dissolving 7.125 kg of urea in 600 litre of water (1.19%) to supply 3.24 kg N/ha. Super phosphate spray solution was prepared a day before by dissolving 51.750 kg of single superphosphate in 600 litre of water (8.625%) to supply 8.28 kg P_2O_5/ha and the supernatant

Table 2. Effect of treatments on primary branches, dry matter production, seed yield and economics of redgram.

Treatments	Primary branches (Nos)	Drymatter production (q/ha)	Seed yield (q/ha)	B : C ratio
S_0	12.4	44.73	8.92	1.65
S_1	13.0	48.08	10.26	1.86
S_2	12.8	47.35	9.85	1.78
CD at 5%	NS	0.82	0.49	-
F_0	10.0	35.84	6.47	1.28
F_1	12.7	47.06	9.42	1.66
F_2	13.3	47.10	9.96	1.82
F_3	12.9	47.08	9.88	1.77
F_4	13.7	51.27	11.07	1.97
F_5	13.9	51.96	11.26	2.02
CD at 5%	0.6	2.62	0.70	-

solution was used for spraying after neutralising with lime water. In case of combined spray the supernatant solution of superphosphate and fresh urea solution were mixed and sprayed immediately. Diammonium phosphate (18:46:0) solution was prepared by dissolving 18 kg of diammonium phosphate in 600 litre of water (3%) and supernatant solution was used for spraying.

RESULTS AND DISCUSSION

Growth Characters: Fertilizer treatments had a favourable effect on plant height, leaf area index and number of branches (table 1 and 2). Basal application of 12.5 kg N and 25 kg P_2O_5/ha recorded higher plant height and LAI on 45th and 75th DAS. This increase in plant height and LAI at early stages might be due to availability of N and P at higher rates for crop growth. But on 105 th and 135th DAS, there was an increase in plant height and LAI in the foliar fertilised treatments. Basal application of 6.25 kg N and 12.5 kg P_2O_5/ha plus foliar spray of three per cent diammonium phosphate or combined spray of urea and superphoshpate recorded higher LAI and primary branches at 135 DAS. The foliar applied N and P might have favoured for better absorption of N and P resulting in delayed leaf senescence, which would contribute for high rates of photosynthesis and LAI upto maturity. Favourable effect of P fertilization on plant height, LAI and number of branches in redgram was reported by Subbian and Ramiah (1982). Seed treatments had no significant influence on plant height, LAI and number of branches.

Dry matter production : Rhizobial seed inoculation and superphosphate pelleting had a significant influence on dry matter production (Table 2). Khurana and Dudeja (1980) also noticed increase in DMP in redgram having rhizobial seed inoculation. Basal application of 6.25 kg N and 12.5 kg P_2O_5/ha plus foliar spray of diammonium phosphate or combined spray of urea and superphosphate recorded higher DMP over other fertilizer treatments. Basal application of N and P would have helped the early vegetative growth and a portion of N and P when applied on the foliage would have contributed more for the reproductive parts and in turn increased the dry matter.

Seed yield : Rhizobium seed inoculation recorded higher seed yield closely followed by superphosphate seed treatment (Table 2). Dahiya et al (1980) obtained higher seed yield of redgram with Rhizobium seed inoculation. Basal application of 6.25 kg N and 12.5 kg P_2O_5/ha plus three per cent diammonium phosphate or combined spray of urea and superphosphate recorded higher seed yield over the other treatments. Among the various seed treatments, the rhizobial seed inoculation recorded higher B:C ration (1.86) and in fertilizer treatments, basal application of 6.25 kg N and 12.5 kg P_2O_5/ha plus three per cent diammonium phosphate recorded higher B:C ratio (2.02) over the other treatments.

This study brings out the benefits of Rhizobium (CC1) seed inoculation with basal application of 6.25 kg N and 12.5 P_2O_5/ha plus foliar spray of three per cent diammonium phosphate on 70th DAS for getting higher productivity of redgram (Co.4) under rainfed situation.

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PLANT DENSITY AND NUTRIENT MANAGEMENT FOR RAINFED MAIZE IN RED SOILS

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ABSTRACT

Experiments indicated that grain yields of 2 t ha^{-1} could be obtained from maize grown during Kharif season under rainfed conditions in the red soils of north-western zone. Varieties Co H 1 and K 1 yielded 2037 and 2060 kg grain ha^{-1}. Plant density of 1,11,000 plants ha^{-1} with a spacing of 45 x 20 cm was found optimum for high yields. An integrated nutrient management system involving the application of azospirillum through seed and soil recorded an yield of 1119 kg ha^{-1} under moisture stress conditions and 2296 kg^{-1} during normal rainfall year. Seed and soil inoculation of azospirillum increased the length and dry weight of roots of rainfed maize.

Under dryland conditions, maize provides a good opportunity for increasing the food production and income from small and marginal farms. Trials conducted in AICRPDA indicated the potential for high yields of rainfed maize. It has already become a popular crop in the semiarid red soils of Bangalore region (Sanghi, 1985). In the North Western Zone of Tamil Nadu, rainfed farming is predominant in red soils. The area under maize here is only 1700 ha. With the development of new technology, dryland maize can become a promising crop in such non-traditional environments also. The components of such a technology package include suitable varieties, optimum plant density and fertilizer manangment practices.

MATERIALS AND METHODS

Field experiments were conducted at Tamil Nadu Agricultural University, Regional Research Station, Paiyur, during 1988-90 to evaluate the potential of maize varieties under rainfed conditions and to evolve cultural practices for getting higher yield from rainfed maize. The soill of the experimental field was red sandy loam, low in available N, medium in P and high in K content. The rainfall received during the cropping season from July to October was 342 and 386 mm in 15 and 21 days, respectively, during the two years of study.

During 1988-89, the experiment was laid out in split plot design, replicated thrice. The main plot

Table 1. Grain yield of maize varieties under two plant densities.

Density ha^{-1} variety	Grain yield Kg ha^{-1} 88-89			89-90		
	1,11,000	83,000	Mean	1,11,000	83,000	Mean
UMH 9	556	509	532	1697	1420	1555
Co H 1	496	409	453	2145	1929	2037
K 1	530	517	523	2145	1975	1792
Co 1	-	-	-	1914	1667	2060
Ganga 5	630	772	772	-	-	-
Mean	553	552		1977	1745	
	CD			CD		
Variety	130			136		
Density	NS			96		