RESEARCH ARTICLE

EFFECT OF AGRONOMIC MANAGEMENT PRACTICES ON GROWTH, YIELD AND ECONOMICS OF GREENGRAM (*VIGNA RADIATA* (L.) WILCZEK)

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Abstract: A field experiment was carried out during summer season 2014 at the Research Farm, JNKVV College of Agriculture, Tikamgarh (M.P.) to study the effect of agronomic management practices on growth, yield and economics of greengram. Amongst the agronomic management practices, application of $N_{20}P_{50}K_{20}$ alongwith one or two hand weedings and spraying of insecticides (two spray each of quinlosphos 2 ml/litre and dimethoate 2 ml/litre) i.e. T_{11} and T_{12} brought about equally maximum growth and yield attributes thereby highest yield of greengram var. SML 668 (693 to 712 kg/ha) and net income (Rs.30479 to Rs.30539/ha). The findings indicate that the combined input of fertilizer (RDF), hand weeding and insecticidal spray is essential to obtain maximum benefit from greengram sown in the summer season.

Keywords: Agronomic management practices, Greengram

INTRODUCTION

Agronomic management plays an important role for realizing higher productivity of improved crop variety. In summer green gram, a high reduction in yield has been reported to occur due to non-use of fertilizers (Singh and Sekhon. 2008), lack of weeding (Singh *et al.,* 2014) and non-adoption of plant protection measures (Borah and Guha 1994). Adoption of improved agronomic practices significantly improved the yield attributes and yield of green gram (Siag and Mann 2004). It is, therefore, essential to use all these inputs/practices for realizing high grain yields. The relative contribution of different inputs in influencing the grain yield, however, varies in different crops. Singh and Sekhon (2002) reported that weed control was the single most important input followed by fertilizers, plant protection and *Rhizobium* inoculation in influencing the grain yield of summer greengram. However, due to high cost of inputs, the farmers might not use all these inputs. Moreover, farmers do not know the relative importance of different inputs for obtaining high grain yields. Keeping in view of above facts, the field experiment was taken up.

MATERIALS AND METHODS

The field experiment was conducted during the summer season 2014 at the Research Farm, JNKVV College of Agriculture, Tikamgarh (M.P.). The experimental soil was silty clay-loam in texture. The soil of the experimental field was clayey loam having pH 6.7, electrical conductivity 20 dS/m, organic carbon 0.5%, available N, P_2O_5 and K_2O 264, 25.7 and 254 kg/ha, respectively. The rainfall during summer season was 10.9 mm. The treatments comprised 12 agronomic management practices (Table 1) which were laid out in randomized block design keeping three replications. The greengram var. SML 668 was sown on 29 March,2014 @ 30 kg seed/ha keeping 30 cm x 10 cm planting geometry. The fertilizers $N_{20}P_{50}K_{20}$ were applied as basal according to the treatments. In all four irrigations were given. The crop was harvested on 14 June, 2014.

RESULTS AND DISCUSSION

Plant growth

Growth parameters like plant height, number of primary branches/plant and leaf area index differed significantly due to different agronomic management practices. The combination of two hand weedings (20 and 40 DAS) + fertilizer application + plant protection measures (T_{12}), which was found statistically at par with combination of one hand weeding (20 DAS) + fertilizer application + plant protection measures (T_{11}) and combination of two hand weeding (20 and 40 DAS) + fertilizer application (T_7) recorded significantly the highest plant height and more number of branches/plant at different growth intervals and at harvest. The significantly better growth of green gram with these treatments clearly indicated that all the 3 practices *viz*., weed control, fertilizer application and plant protection measures had positive effect on growth parameters as compared to other agronomic management practices, whereas the lowest plant height, number of branches/plant and leaf area index recorded where none of the weed control, fertilizer application and plant protection measure were adopted. These results are in line with the findings of Singh and Sekhon (2002), Singh and Sekhon (2008) and Asaduzzaman *et al*. (2010).

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Similarly, total dry biomass and its partitioning into leaf, stem and pods (g/plant) were also produced under agronomic management practice *i.e.*, combination of two hand weeding control (20 and 40 DAS) + fertilizer application + plant protection measures (T_{12}) and found statistically at par with agronomic management practices of combination of one hand weeding (20 DAS) + fertilizer application + plant protection measures (T_{11}) and combination of two hand weeding (20 and 40 DAS) + fertilizer application (T_7). The better growth of plants in terms of plant height, number of branches and leaf area index resulted into higher dry biomass accumulation of plants in these treatments.

The control plot (T_1) in which no agronomic management practices were applied, recorded significantly poor growth in term of plant height, number of branches/plant and leaf area index reflected into lesser total dry biomass accumulation and its partitioning into different plant parts at all growth intervals and at harvest. When there was no fertilizer application, no weed control and no plant protection, plants became thin and leaf enlargement and thickness of branching were adversely affected due to more and fast consumption of inputs (nutrients and moisture) by weeds and more infestation of insect-pest and diseases, where none of weeding, fertilizer application and plant protection measures were adopted. Similar results were reported by Khan and Khan (2005), Singh and Sekhon (2008) and Asaduzzaman *et al*. (2010).

Yield-attributes and yield

The seed yield of green gram differed significantly due to different agronomic management practices. The significantly highest seed yield (712.2 kg/ha) was recorded under the agronomic management practice combination of two hand weeding (20 and 40 DAS) + fertilizer application + plant protection measures (T_{12}) and found statistically at par with combination of one hand weeding (20 DAS) + fertilizer application + plant protection measures (T_{11}) and combination of two hand weeding (20 and 40 DAS) + fertilizer application (T_7). The favourable effect of combined use of weeding, fertilizer and plant protection measures on sink component (number of effective pods, number of seeds/pod and test weight) could be attributed to the higher seed yield recorded under T_{12}, T_{11}, and T_7 treatments. These results corroborate the findings of Singh and Sekhon (2002), Khan and Khan (2005), Singh and Sekhon (2008) and Asaduzzaman *et al*. (2010).

Agronomic management treatments *viz*., T_{12} (combination of two hand weeding (20 and 40 DAS) + fertilizer application + plant protection measures), T_{11} (combination of one hand weeding (20 DAS) + fertilizer application + plant protection measures), and T_7 (combination of two weeding (20 and 40 DAS) + fertilizer application) increased the seed yield by 130.4%, 124.2%, and 117.0%, respectively over control, 37.2%, 33.5%, and 29.2%, respectively over application of RDF alone (T_4), 60.6%, 56.3% and 51.3%, respectively over application of plant protection alone (T_5), 37.3%, 33.6% and 29.3%, respectively over application of RDF + PP (T_{10}), 32.2%, 28.7% and 24.5%, respectively over application of one weeding at 20 DAS (T_2) and 14.6%, 11.5% and 7.97%, respectively over application of two hand weedings at 20 DAS and 40 DAS (T_2). In other words, weed control was the most limiting factor, followed by fertilizer application and plant protection measures. Similar results were reported by Singh and Sekhon (2002). Effective weed control had been reported to increase the seed yield of summer green gram considerably (Varshney and Chary, 2000). The results suggest that to obtain the higher seed yield, all the 3 practices *viz*., weed control, fertilizer and plant protection measures should be followed. In case farmers, due to one or the other reason, want to skip any practice, they may skip plant protection but not the weed control. Sekhon *et al*., 1993, Borah and Guha, 1994 and Singh and Sekhon, 2002 also reported weed control to be the most important input in summer green gram.

The control treatment (T_1) recorded significantly lowest seed yield of 309.6 kg/ha. The reduction in the seed yield in control treatment could be attributed to poor yield attributes *viz*., number of effective pods/plant, number of seeds/pod and test weight of 1000-seeds on account of decreased growth in term of plant height, number of branches, leaf area index and lesser dry biomass accumulation. These results are in line with the findings of Singh and Sekhon (2008) and Asaduzzaman *et al*. (2010).

Table 1. Growth, yield-attributes, yield and economics of greengram as influenced by different agronomic management

Treatments	Plant height (cm)	Primary branches/ plant	Leaf area index	Number of effective pods/ plant	Number of seeds/ pod	Test weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)	Net monetary return (Rs/ha)	B:C ratio
T_1: Control (no weeding, no plant protection and no fertilizer)	36.9	3.1	0.65	9.30	9.0	41.6	309.1	1284.0	19.4	10827	0.85
T_2: One hand weeding at 20 DAS (W_1)	41.6	3.6	0.71	11.9	9.8	42.3	538.7	1734.3	23.7	24082	1.47
T_3: Two hand weeding at 20 DAS and 40 DAS (W_2)	42.8	3.6	0.72	12.4	9.8	42.1	621.4	1925.3	24.4	28790	1.61
T_4:RDF ($N_{20}P_{50}K_{20}$)as basal	39.7	3.4	0.67	10.5	9.5	42.9	519.1	1884.0	21.6	22765	1.38

dose (F)											
T_5: Plant protection (PP)	38.6	3.2	0.66	10.0	9.4	41.6	443.4	1658.0	21.1	19629	1.41
T_6: One hand weeding at 20 DAS (W_1) + F	47.8	4.0	0.76	13.7	10.2	42.1	659.2	1876.2	26.0	29246	1.46
T_7: Two hand weeding at 20 DAS and 40 DAS (W_2) + F	50.9	4.7	0.78	15.3	10.4	41.8	670.9	1870.4	26.4	28644	1.33
T_8: One hand weeding at 20 DAS (W_1) + PP	43.7	3.7	0.73	12.6	9.9	41.8	622.8	1898.6	24.7	29183	1.66
T_9: Two handweeding at 20 DAS and 40 DAS (W_2) + PP	44.8	3.8	0.74	13.6	10.0	42.3	648.2	1883.7	25.6	29556	1.56
T_{10}: RDF as basal dose (F) + PP	40.2	3.4	0.69	11.4	9.6	41.8	518.8	1797.1	22.4	21535	1.22
T_{11}: One hand weeding at 20 DAS (W_1) + F + PP	51.5	4.9	0.78	15.5	10.4	43.0	693.1	1845.8	27.3	30539	1.44
T_{12}: Two hand weeding at 20 DAS and 40 DAS (W_2) + F + PP	52.4	5.0	0.80	16.1	10.5	43.2	712.2	1849.8	27.8	30479	1.35
CD (P=0.05)	**2.48**	**0.26**	**0.03**	**0.99**	**0.33**	**1.70**	**47.3**	**159.5**	**2.11**	--	--

Economics

The data clearly revealed that the combination of two hand weeding (20 and 40 DAS) + fertilizer application + plant protection (T_{12}) and weed control (20 DAS) + fertilizer application + plant protection (T_{11}) resulted into the net monetary return (Rs. 30539 and Rs. 30479/ha, respectively) as compared to other treatments. The higher NMR with these treatments was due to higher seed and straw yields in these treatments. However, minimum NMR (Rs.10827/ha) was recorded in control plots because of lower seed and straw yields. These results corroborate the findings of Singh and Sekhon (2002) and Singh and Sekhon (2008).

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