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INFLUENCE OF NUTRIENT, WEED AND PEST MANAGEMENT PRACTICES ON PERFORMANCE OF MUNGBEAN (*Vigna radiata* L.)

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Abstract: The field experiment was carried out during three consecutive seasons of *kharif* 2014, 2015 and 2016 at Pulses Research Station, S.D. Agricultural University, Sardarkrushinagar, Gujarat, to study the influence of nutrient, weed and pest management practices on performance of mungbean (Vigna radiata L.) Effect of different combinations of nutrient, weed and pest management practices was measured on seed yield of mungbean. Significantly higher seed yield of 911 kg/ha was recorded by combined application of nutrient, weed and pest management practices (T_8) and remained at par with treatment T_5 (NM+WM) recorded seed yield of 873 kg/ha. Combined application of nutrient, weed and pest management practices (T_8) secured the highest net return of Rs. 27621 /ha followed by T_5 (NM + WM) of Rs. 26814, while highest B: C ratio of 1.36 was noticed under T_3 (WM).
Keywords: Mungbean, Weed, Nutrient, Pest, Seed yield.

INTRODUCTION

Among the pulses, green gram (*Vigna radiata* L.) is one of the most important and extensively cultivated crops in India, Which is cultivated in arid and semi arid region. Green gram is locally known as "*moong*". It contains about 25 % protein, 1.3 % fat, 3.5% mineral, 4.1 % fiber and 56.7 % carbohydrate which form an important part of vegetarian diet. In spite of the importance of this crop in our daily diet average productivity of this crop is very low in India as well as in the Gujarat (Chaudhari *et al*, 2016). Requirement of pulses is increasing continuously and there is need to increase pulses production in the country. Higher mungbean production can contribute in total pulses production considerably. The crop is mainly grown in June-July and harvested as per maturity duration. It is a cheap source of protein as compared to animal protein. India being major pulses producing country contributes almost 80% of total production and area in the world. The productivity of this crop is very low because of its cultivation on marginal and sub marginal lands of low soil fertility where little attention is paying to adequate fertilization. In greengram, a high reduction in yield has been reported to occur due to non use of fertilizers. Although, chemical fertilizers are playing crucial role to meet nutrients need of the crop, the imbalance and continuous use of chemical

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fertilizers has adverse effect on soil physical, chemical and biological properties thus affecting the sustainability of crop production. On the other hand, use of organics alone does not result in spectacular increase in crop yields, due to their low nutrient status. Therefore, integrated management of chemical, organic and bio fertilizers may be an important strategy for sustainable production of crops. This may not only improve the efficiency of chemical fertilizers along with their minimal use in crop production besides providing stability in crop production with higher crop yield and improving available major and minor nutrients (Tyagi and Upadhyay, 2015). Weed management is an important key factor for enhancing the productivity of green gram, as weeds compete for nutrient, water, light and space with crop plants during early growth period. Moreover, besides low yield of crop, they increase production cost, harbor insect-pest and diseases, decreasing quality of farm produce and reduce land value of the different factors known for reduction in crop production, among them weed stand first. Weeds spread easily, because of their enormous seed production and once established are not easily eradicated. Life cycle of most of them coincide with that of crop they invade, thus ensuring mixing of their seed with those of the crops. Depending on weed type and crop weed competition it reduces mungbean yield ranges from 65.4 to 79.0 % (Chaudhari *et al*, 2016). So, if weed growth is minimize during the period of crop weed competition, crop yield will be equivalent to that of weed free crop. Therefore, it is an essential to control weeds by any means during crop weed competition. The pests like sap feeder such as white fly (*Bemesia tabaci* Genn), jassid (*Empoaska kerri* Pruthi) aphid (*Aphis crassivora* Koch) thrips (*Caliothrips indicus* Bagrale), foliage feeder, flee beetle and pod borer are the major insect pests causing directly or indirectly yield losses (Ahirwar *et al,* 2016). Development of disease and insect resistant varieties and adoption of suitable management production factors have been proved to achieve higher yield. A field experiment therefore, was formulated to study the effect of integration of different crop management practices on yield, quality and economics of *Kharif* mungbean.

MATERIALS AND METHODS

The present investigation was conducted at Pulses Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during *kharif* seasons of 2014, 2015 and 2016. The soil of experimental site was loamy sand in texture with 7.7 pH, low in organic carbon (0.16 %), medium in available nitrogen (275 kg ha^{-1}), available P_2O_5 (47.6 kg ha^{-1}) and available K_2O (213.4 kg ha^{-1}). Mungbean variety Gujarat mungbean 4 (GM 4) was sown at month of July with line sowing method in

randomized block design with three replications and consist of nine treatments *viz.,* T_1: Control, T_2: Nutrient management (NM - 20 + 40 NP kg/ha along with seed inoculation with *Rhizobium* + PSB (250 g/8 kg seed), T_3: Weed management (WM- Pendimethalin 30 EC + Imazethapyr 2 EC (ready mixture) @ 0.75 kg/ha-PE + one manual weeding at 35-40 DAS), T_4: Pest management (PM-Seed treatment with Imidachloprid 70 WS @ 5 ml/kg of seed coupled with foliar spray of prophanophos @ 2 ml/lit water, if required), T_5: NM + WM, T_6: NM + PM, T_7: WM + PM, T_8: NM + WM + PM, and T_9: Farmer's practice i.*e.,* 20: 40, N P Kg/ha and one interculturing *fb* hand weeding at 30 DAS. The seeds were placed at 3-5 cm depth by manually in furrow keeping row to row spacing of 30 cm and plant to plant distance of 10 cm. Pre emergence herbicide Pendimethalin were measured by measuring cylinder as per the required quantity at the time of preparation of solution and applied at next day after sowing (DAS) with knapsack sprayer fitted with flat-fan nozzle using 500 liter water/ha. Recommended dose of fertilizers (20-40-00 kg N- P_2O_5 -K_20/ha) was applied in the form of diammonium phosphate and urea at the time of sowing. Mungbean seed was treated with carrier based *Rhizobium* and PSB, each at the rate of 250 g per 8 kg seed and mixed well to ensure the inoculums to stick on to the surface of the seeds as per the treatment requirement. Total dry weight of weeds was taken using quadrate of 0.25 m^2 size at 30 DAS. Weed data were subjected to square root transformation ($\sqrt{x+0.5}$) for uniformity before statistical analysis. Seed yield and economics recorded through standard practices.

RESULT AND DISCUSSION

Effect on weeds

The data on weed dry weight at 30 days after sowing (Table 3) indicated that weed management practice alone resulted in considerable reduction in total weed dry weight than other management practices. The lowest weed dry weight was recorded by pre emergence application of Pendimethalin @ 1 kg a.i/ha *fb* one hand weeding at 30 days after sowing (weed management) during consecutive three years and in pooled result (8.24, 10.93, 12.67 and 10.61 g/m_2, respectively). This might be due to effective control of weed throughout the crop growth period; it led to check the weeds effectively and reduced crop-weed competition in the initial stage and removal of the late emerged weeds by interculturing at 35-40 days after sowing. One hand weeding done at 25 days after sowing (DAS) reduced the density and dry matter of weeds significantly also been recorded by (Brijbhooshan *et al*, 2017). Among the other herbicidal treatments, Pendimethalin and hand weeding was superior in controlling

weeds and increasing the seed yield reported by (Chaudhari *et al,* 2016), (Chhodavadiya *et al,* 2014) and (Nandan *et al,* 2011).

Effect on growth and yield attributes

Growth attributes of greengram were significantly affected by different management practices during all the years (Table 2). The higher plant height (56.7 cm) and no. of branches per plant (3.1) were recorded by treatment T_8 *i.e.,* combination of nutrient, weed and pest management practices and remained at par with the treatment T_3 and T_5. This might be due to higher nutrient content and uptake by the crop in absence of weeds. Application of recommended dose of fertilizer along with vermicompost recorded its superiority by recording higher growth attribute reported by (Pal *et al*, 2016) and (Biyan *et al,* 2014). Sandhya and Eswari (2008) were also found combination of physical and chemical method of pest control gives higher growth and yield attributes. Significantly the higher no. of pods per plant (18.9) was recorded under the treatment T_8 which was remained at par with the treatment T_5. Pod length, seeds per pod and protein content shows non significant effect with the treatments and recorded maximum as 8.40 cm, 11 and 22.30 %, respectively with the combination of nutrient, weed and pest management practices.

Effect on seed yield and straw yield

Seed yield significantly affected by all management practices and their combinations. In the year 2015 and 2016 higher seed yield (596 and 1514 kg/ha, respectively) was recorded by treatment T_8 *i.e.,* combination of nutrient, weed and pest management practices which remained at par with treatment T_5 and T_3. While in the year 2014 higher seed yield (642 kg/ha) was recorded by treatment T_5 *i.e.,* combination of nutrient and weed management practices and remained at par with T_8. In the pooled results higher seed yield (911 kg/ha) was recorded by treatment T_8 *i.e.,* combination of nutrient, weed and pest management practices and remained at par with T_5 (NM+WM) recorded seed yield of 873 kg/ha. Among the application of nutrient, weed and pest management alone, weed management again recorded significantly higher grain yield (821 kg/ha) than nutrient management and pest management and remained at par with T_5 (NM + WM). This showed that weeds are major yield limiting factor in greengram. Adoption of weed management *i.e.,* application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mixture) @ 0.75 kg/ha- PE + mannual weeding at 35-40 DAS) performed better and produced higher grain yield alone or in combination of other practices. The minimum seed yield (516 kg/ha) was recorded by control treatment (T_1). Integrated

nutrient management increase seed yield of mungbean reported by (Meena *et al,* 2016) and (Kaushal and Singh, 2011).

Same trend was observed in the pooled results of straw yield. Significantly higher straw yield 2516 kg/ha was recorded in T_8 *i.e.,* combination of nutrient, weed and pest management practices and remained at par with T_5 (NM + WM) and T_3 (2499 and 2205 kg/ha, respectively), While the lowest straw yield was recorded in control (T_1).

Economics

The data (Table 1) indicate that the maximum net returns (Rs. 27621) was realized with treatment T_8 *i.e.,* integration of nutrient, weed and pest management practices. The higher seed and straw yields with these treatments may be the reason for the resultant net profit. While maximum B: C ratio (1.36) was recorded in treatment T_3 *i.e.,* weed management.

The results lead to a conclusion that the application of basal dose of 20 kg N and 40 kg P_2O_5/ha and seed treatment with *Rhizobium* and PSB @ 250 g each/8 kg seed and apply Pendimethalin 30 EC + imazethapyr 2 EC (ready mixture) @ 0.75 kg/ha as pre emergence *fb* hand weeding at 35-40 days after sowing and spray prophenophos @ 2 ml/liter water (if required) may be suggested for higher economic returns and yield along with overall betterment of Mungbean crop.

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Table 1: Effect of different crop management practices on seed and straw yield, net return and B: C ratio of mungbean

Sr. No.	Treatment	Seed Yield (kg/ha)				Straw Yield (kg/ha)				Net return (Rs/ha)	B:C ratio
		2014	2015	2016	Pooled data	2014	2015	2016	Pooled data		
T_1	Control	343	274	932	516	1577	923	2136	1545	14003	0.94
T_2	Nutrient management (NM)	413	348	1181	647	2049	962	2792	1934	18822	1.08
T_3	Weed management (WM)	569	538	1357	821	1955	1571	3089	2205	26183	1.36
T_4	Pest management (PM)	412	293	1159	621	1915	881	2299	1698	18447	1.15
T_5	NM + WM	642	575	1401	873	2314	2037	3146	2499	26814	1.23
T_6	NM + PM	400	282	1208	630	1709	1209	2706	1875	16712	0.90
T_7	WM + PM	480	486	1238	735	1971	1569	2805	2115	20542	1.01
T_8	NM + WM + PM	622	596	1514	911	2185	2092	3272	2516	27621	1.20
T_9	Farmer's practice	465	342	1204	670	2087	923	2500	1836	18251	0.96
	S.Em.+	40.70	24.32	87.46	29.12	92.29	90.84	198.69	124.94	-	-
	C.D. at 5%	140	72.91	262.18	87.30	276.7	272.29	595.57	374.56	-	-
	C.V. %	16.75	10.16	12.18	14.30	8.10	11.64	12.52	11.71	-	-
	Y	-	-	-	Sig	-	-	-	Sig	-	-
	Y x T	-	-	-	NS	-	-	-	Sig	-	-

Table: 2 Effect of crop management practices on growth and yield attributes in mungbean

Sr. No.	Treatment	Plant height(cm)	No. of Branches/plant	No. of pods/plant	Pod length (cm)	No. of seeds/pod	Protein content (%)
T_1	Control	49.1	2.2	12.3	7.6	9.9	21.82
T_2	Nutrient management (NM)	51.1	2.5	14.4	7.8	10.6	21.64
T_3	Weed management (WM)	54.1	2.8	16.3	8.4	10.6	21.65
T_4	Pest management (PM)	49.2	2.1	12.6	7.7	10.6	20.93
T_5	NM + WM	55.0	2.9	18.0	7.9	11.0	22.11
T_6	NM + PM	52.6	2.4	13.1	7.8	10.4	21.81
T_7	WM + PM	49.4	2.6	14.3	7.4	10.4	22.05
T_8	NM + WM + PM	56.7	3.1	18.9	8.4	11.0	22.30
T_9	Farmer's practice	52.1	2.3	13.4	7.8	10.4	21.50
	SEm ±	1.47	0.16	0.76	0.25	0.46	0.37
	C. D. (0.05 %)	4.40	0.49	2.28	0.74	1.39	1.11
	C. V. (%)	9.60	15.49	15.71	6.52	11.74	2.32
	Y	Sig	NS	Sig	NS	NS	NS
	Y x T	NS	NS	NS	Sig	NS	NS

Table: 3 Effect of different treatments on weed dry weight (g/m^2) at 30 DAS in mungbean

Sr. No.	Treatment	Weed dry weight (g/m^2) at 30 DAS			
		2014	**2015**	**2016**	**Pooled data**
T_1	Control	4.85 (23.52)	5.88 (34.27)	4.83 (23.0)	5.19 (26.93)
T_2	Nutrient management (NM)	4.60 (20.75)	5.11 (26.00)	5.26 (27.37)	4.99 (24.70)
T_3	Weed management (WM)	2.94 (8.24)	3.35 (10.93)	3.62 (12.67)	3.30 (10.61)
T_4	Pest management (PM)	5.29 (27.52)	4.66 (21.33)	4.52 (20.27)	4.82 (23.04)
T_5	NM + WM	3.33 (10.77)	3.79 (13.87)	3.76 (13.77)	3.62 (12.80)
T_6	NM + PM	5.06 (25.36)	5.39 (28.80)	4.74 (22.03)	5.06 (25.40)
T_7	WM + PM	3.55 (12.24)	3.93 (15.17)	3.64 (12.93)	3.71 (13.45)
T_8	NM + WM + PM	3.32 (10.59)	3.54 (12.17)	3.67 (13.17)	3.50 (11.97)
T_9	Farmer's practice	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
	S.Em.+	0.27	0.31	0.25	0.18
	C.D. at 5%	0.8	0.9	0.7	0.55
	C.V. %	12.61	13.10	11.06	12.31
	Y	-	-	-	NS
	Y x T	-	-	-	NS