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Effect of weed management practices on moong crop yield

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Abstract
The prevailing experiment entitled "effect of Weed management Practices on Moong Crop Yield" become conducted in the course of the kharif season of 2019-20 underneath, SAGE university, Rau, Indore (M.P.) to find out the impact of different plant spacing along side weed manipulate strategies on the increase and yield of mungbean. The objectives of the investigation had been First is to examine the impact of various stages of plant spacing at the boom, yield attributes, Second is yields of mungbean to discover an appropriate method of weeding for max yield of mungbean and Third is to examine the mixed impact of plant spacing and weeding technique on the increase and yield of mungbean. The experiment was laid out in a break up plot design with 3 replications. The test comprised with elements *viz*., (i) Row spacing and (ii) Weed control. Three plant spacings (A1= 20x10 cm2, A2= 30x10 cm2, A3= 40x10 cm2) and 5 weeding treatments no weeding (B1), one hand weeding at 20 DAS (B2), hand weedings at 20 DAS and forty DAS (B3), Pendimethalin @ 1.25 kg/ha (B4) and Imazethapyr @ a hundred g/ha (B5)., Pendimethalin @ 1.25 kg/ha a pre-emergence herbicide become implemented after final land practise. Imazethapyr @ 100 g/ha, a publish-emergence herbicide turned into implemented at 25 DAS whilst weeds were 2-three leaf degree had been used. There have been 15 treatment combos. Plant spacing turned into placed along the primary plot and weeding methods had been placed along the sub plot. Statistics on specific increase, yield contributing characters and yield were recorded from the experimental discipline and analyzed statistically.

Keywords: Hand weedind, plant spacing, harbicides, green gram, weed, yield

Introduction
Green gram crop (*Vigna radiata* L.) is one of the most crucial and notably cultivated crops of the arid and semi-arid areas of the India. Green gram is domestically called "moong". It contains approximately 25% protein, 1.3% fats, 3.5% mineral, 4.1% fiber and 56.7% carbohydrate. No matter the importance of this crop in our daily weight-reduction plan common productivity of this crop could be very low in India in addition to in the Gujarat. The low manufacturing of this crop is specially because of crop-weed competition and other reasons. Weeds spread effortlessly, due to their considerable seed manufacturing and once established aren't effortlessly eliminated. Life cycle of most of them coincide with that of crop they invade, thus ensuring mixing of their seed with the ones of the plants. Weed management is an vital key issue for enhancing the productiveness of inexperienced gram, as weeds compete for nutrient, water, light and space with crop plants for the duration of early growth length. Furthermore, except low yield of crop, they increase manufacturing cost, harbor insect-pest and diseases, decreasing satisfactory of farm produce and reduce land value of the various factors regarded for reduction in crop manufacturing, among them weed stand first (Subramainian *et al.*, 1993).

Depending on weed kind and crop weed competition it reduces crop yield up to 96.5% (Verma *et al.*, 2015), while the loss of green gram yield due to weeds tiers from 65.4 to 79.0% (Dungarwal *et al.*, 2003). Being a wet season crop, it's miles invaded via a big numbers of rapid growing weeds. The important duration of weed opposition in greengram is all through the first 30-40 days after sowing. Weeds develop quickly at some point of this time taking the benefit of plants' sluggish preliminary boom. Relying on weed kind and crop weed opposition it reduces crop yield as much as ninety 6.5%. Whereas the lack of mung bean yield due to weeds ranges from 65.4 to 79.0%. The value of losses in large part relies upon upon the composition of weed flora, duration of weed-crop opposition and its intensity.

Weeds emerge with the summer season sown vegetation and create excessive opposition until managed well timed and efficiently. Manual weeding is no doubt quite powerful, however it is time consuming, steeply-priced and tedious one. Beneath such situation, the use of powerful herbicide at appropriate price may also prove as an powerful weed manipulate approach and replace conventional methods of weed manipulate. Selective herbicides or chemical weeding is higher, as it's far affordable, smooth and efficient. Therefore, it's miles an important to control weeds with the aid of any way throughout crop weed opposition. This paper deals with the objective of to study effect of various weed control practices on boom and yield and efficacy of various herbicides for controlling weeds in inexperienced gram.

Materials and Methods

The present experiment turned into laid out in the subject of the research farm of department of Agronomy, Sage university, Indore to study effect of various weed control practices on boom and yield and efficacy of various herbicides for control weeds in experienced Green gram. The experiment was specified in a break up Plot layout having three replications. There have been 15 treatment combos and 45 unit plots. The unit plot size became 7.2 m2 (4 m × 1.8 m). The fertilizers had been implemented as basal dose @ N, P and ok as 20, 17.20 and 17.60 kg ha-1 at final land guidance respectively in all plots. All fertilizers have been implemented through broadcasting and blended thoroughly with soil. Seeds were sown at the rate of 40 kg ha-1 within the furrow on 20th July, 2019 and the furrows were covered with the soils quickly after seeding. The data obtained were analyzed statistically by the analysis of variance method. The experimental soil were sandy loam under upland situation with good drainage facility, having soil pH 7.6, organic carbon 0.28%, total nitrogen 214 kg/hac, available phosphorus 16.6 kg ha- ^{1}, available potassium 385 kg ha^{-1} and were estimated by combined glass electrode pH meter method, Walkey and Black's rapid titration method, Alkaline permanganate method (Subbaiah and Asija, 1956), Bray's method (Jackson, 1973), Photometery (Jackson, 1973) respectively. There were two factors in the experiment namely spacing (i.e. line to line and plant to plant distance) and weeding that is Factor-1 (Plant spacing: 3) A1 = 20 cm ×10 cm, A2 = 30 cm ×10 cm, A3 = 40 cm ×10 cm. Factor-2 (Weed management: 5)B1 = No weeding (control), B2 = One hand weeding at 20 days after sowing (DAS), B3 = Two hand weeding at 20 DAS and 40 DAS, B4 = Pre emergence herbicide, Pendimethalin @ 1.25 kg/ha spraying before land preparation, B5 = Post emergence herbicide, Imazethapyr @ 100 g/ha spraying at 25 days after sowing (DAS) and there interaction effect.

Results

Weed Flora

Seventeen weed species infested the experimental plots belonging to 8 households have been found to infest the experimental crop. The maximum vital weeds of the experimental plots have been Cynodondactylon, Cyperus rotundus, Eleusine indica, Eichinochloacrussgali respectively. Weed density, relative weed density, weed biomass and weed control efficiency were appreciably prompted by means of the weed manipulate treatments. It turned into located that the species, Durba (Cynodondactylon) accounted the best in range and thereafter had been Mutha, Malancha, Carpet grass and so forth. The bottom weed in number was Anguli. It is observerd that Weeds compete with main crop for area, nutrients, water and mild. It is also identified that a low weed populace may be beneficial to the crop because it offers meals and habitat for a number of beneficial organisms stated by Bueren *et al.* (2002) [5].

Weed biomass

Weed population had huge effect on crop production. Records on table-1 showed that the highest dry weight of weed was determined in A3B1 wherein no weeding was finished with higher row spacing whilst maximum spacing invited weeds to develop profusely. The bottom dry weed biomass (97.17 g m-2) became discovered in A2B5 where submit emergence herbicide changed into carried out. Mirjha *et al.* (2013) [11] said that yield attributes and yield of mungbean were notably improved in weed manage treatment over weedy test even as a area trial turned into done in India with weed management. It is also observed by Chattha *et al.* (2007) [6] performed that maximum reduction in density and biomass of the weeds became determined by using chemical weeding at 2 - 3 leaf degree of weeds + hand weeding at 50 DAS.

Table 1: Weed density as per treatment combinations

Treatments	Number of weed species	Total weeds m^{-2} during crop growing period	Total dry weight of weed (g m^{-2}) during crop growing period
A_1B_1	11.84	224.10	367.55
A_1B_2	10.22	101.97	177.99
A_1B_3	12.05	160.09	232.00
A_1B_4	9.48	87.43	131.26
A_1B_5	7.98	72.99	102.13
A_2B_1	12.29	243.68	377.66
A_2B_2	8.82	141.76	193.33
A_2B_3	10.56	130.20	191.12
A_2B_4	10.87	94.36	121.23
A_2B_5	9.27	77.87	97.17
A_3B_1	12.83	258.14	389.17
A_3B_2	9.92	150.69	183.24
A_3B_3	7.22	172.91	195.20
A_3B_4	10.03	95.29	119.42
A_3B_5	9.48	89.49	112.57

Dry matter Weight

Table- 2 Suggests that at 10,20,30,40,50 and at harvest row spacing had widespread impact on above floor dry depend at 30 DAS and the effect of weeding strategies on above ground dry remember was also discovered to be substantial. Significantly, maximum above ground dry matter had been

attained by means of treatment A3 wherein spacing became 40×10 cm2. The variations in above ground dry be counted amongst numerous weeding techniques were confirmed giant effect. The maximum above floor dry count number recorded in B5 (Imazethapyr @ a hundred g/ha).it is also similar with Khan *et al.* (2017) [9].

The interactions among row spacing and weeding had been found to be significant. Amongst interaction of combination of different spacing and weeding strategies, the facts supplied in desk-2, indicated that the highest above ground dry count recorded inside the 40×10 cm2 spacing with post emergence herbicide (Imazethapyr @ 100 g/ha) for weed management (A3B5). Rachaputi *et al.* (2015) [14] investigated the volume and physiological bases of yield variation because of row spacing and plant density configuration within the mungbean [*Vigna radiata* (L.) *Wilczek*] range "Crystal" grown in unique subtropical environments.

Table 2: Effect of row spacing and weed management on above ground dry matter per plant of mungbean at differentdays

Treatments		Above ground dry matter weight plant^{-1} (g) at different days after sowing					
		10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	At harvest
	Effect of row spacing						
A_1		0.20	0.88	2.54	7.83	10.03	10.07
A_2		0.21	0.93	2.70	8.05	10.41	10.63
A_3		0.22	0.98	2.95	8.74	11.37	12.38
S.Em±		0.003	0.01	0.04	0.08	0.16	0.16
CD at 5%		0.01	0.04	0.12	0.24	0.45	0.47
	Effect of weed management						
B_1		0.18	0.57	1.67	5.01	6.44	6.74
B_2		0.20	0.82	2.58	7.44	9.81	10.12
B_3		0.21	1.08	3.18	9.41	12.20	12.59
B_4		0.19	0.67	1.85	5.94	7.55	7.91
B_5		0.23	1.15	3.31	10.03	12.84	13.49
S.Em±		0.004	0.02	0.05	0.11	0.20	0.21
CD at 5%		0.01	0.05	0.15	0.31	0.58	0.61
	Interaction effect of row spacing and weed management						
A_1B_1	T1	0.17	0.54	1.62	4.89	6.16	6.19
A_1B_2	T2	0.19	0.81	2.40	7.28	9.56	9.60
A_1B_3	T3	0.20	0.99	2.92	8.86	11.14	11.19
A_1B_4	T4	0.18	0.64	1.75	5.74	7.23	7.27
A_1B_5	T5	0.22	1.09	3.10	9.44	12.17	12.20
A_2B_1	T6	0.18	0.58	1.68	4.97	6.51	6.54
A_2B_2	T7	0.20	0.86	2.64	7.38	9.84	9.88
A_2B_3	T8	0.21	1.04	3.09	8.99	11.77	11.83
A_2B_4	T9	0.19	0.65	1.88	5.83	7.64	7.68
A_2B_5	T10	0.23	1.12	3.19	9.98	12.39	13.14
A_3B_1	T11	0.19	0.60	1.71	5.16	6.64	7.48
A_3B_2	T12	0.21	0.89	2.69	7.67	10.04	10.88
A_3B_3	T13	0.22	1.21	3.54	10.40	13.69	14.75
A_3B_4	T14	0.20	0.68	1.91	6.23	7.79	8.78
A_3B_5	T15	0.24	1.25	3.65	10.67	13.96	15.12
S.Em±		NS	0.03	0.09	0.19	0.35	0.36
CD at 5%		NS	0.09	0.26	0.54	1.01	1.05

Yield attributes

Information on above floor dry count at specific days of mungbean changed into prompted with the aid of varying row spacing were provided in Table-3. The variations in number of pods plant^{-1}, Pod length (cm), Seeds pod^{-1}(no.), 1000-seeds weight (g) according to plant amongst various row spacing were confirmed massive effect. Maximum pods per plant, Pod Length in cm, seeds per pod and 1000 seed weight were recorded in A3 (40×10 cm2) observed with the aid of A2 (30×10 cm2). The minimal pods according to plant were found in A1 (20×10 cm2). A field trial turned into carried out an experiment in Bangladesh by Akter *et al.* (2013) [2] and observed that three-stage weeding (Emergence-Flowering and Flowering-Pod putting and Pod setting-maturity) ensured the very best number of pods (22.03) plant-1. The variations in pods according to plant among various weeding methods were showed enormous impact. The most pods per plant recorded in B5 (Imazethapyr @ a hundred g/ha) followed by B3 (hand weeding). Similar Results find with Foysalkabir *et al.* (2016) [7]. Kabir and Sarker (2008) [8] carried out an experiment on mungbean in Bangladesh and mentioned that the best pod duration became received at 30 cm × 10 cm spacing.

The interactions between row spacing and weeding had been discovered to be great. Among interplay of aggregate of different spacing and weeding methods, the statistics supplied in desk-5. indicated that the very best number of pods plant^{-1}, Pod length (cm), Seeds pod^{-1}(no.), 1000-seeds weight (g) with plant recorded within the 40×10 cm2 spacing with submit emergence herbicide (Imazethapyr @ 100 g/ha) for weed control (A3B5) which become at par with A3B3 (40×10 cm2 spacing with hand weeding). At 20×10 cm2 spacing, all of the weeding methods done considerably poorer over both the spacing (30×10 cm2 and 40×10 cm2). The minimal pods in line with plant was received with A1B1 (20×10 cm2 spacing with out weeding) which changed into at par with A2B1 (30×10 cm2 spacing with out weeding) Muchira *et al.* (2018) [12] investigated the effects of Spacing and Fertilizer software on increase and grain yield of Mung beans. Nadeem *et al.* (2004) [13] carried out a discipline experiment to examine the effect of planting patterns. Results also similar with Kundu *et al.* (2009) [10] stated that seeds pod-1 was highest in the remedy having quizalofop-p-ethyl @ 50 g a.i. Ha-1 at 21 DAE + HW at 28 DAE.

Table 3: Effect of row spacing and weed management on yield attributes of mungbean at differentdays

Treatments	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1}(no.)	1000-seeds weight (g)
Effect of row spacing				
A_1	9.01	7.67	9.07	35.56
A_2	9.45	8.11	9.49	37.78
A_3	10.38	8.81	10.41	41.38
S.Em±	0.14	0.12	0.14	0.56
CD at 5%	0.41	0.35	0.41	1.63
Effect of weed management				
B_1	5.84	4.96	5.89	23.56
B_2	8.72	7.37	8.71	35.04
B_3	11.09	9.43	11.16	44.24
B_4	6.83	5.82	6.87	27.49
B_5	11.82	10.17	11.88	46.18
S.Em±	0.18	0.16	0.18	0.73
CD at 5%	0.53	0.45	0.53	2.11
Interaction effect of row spacing and weed management				
A_1B_1	5.58	4.74	5.60	22.42
A_1B_2	8.30	7.04	8.33	33.34
A_1B_3	10.10	8.57	10.13	40.55
A_1B_4	6.55	5.56	6.57	26.32
A_1B_5	11.09	9.52	11.25	42.03
A_2B_1	5.90	5.01	5.92	23.69
A_2B_2	8.77	7.44	8.80	35.23
A_2B_3	10.67	9.05	10.70	42.84
A_2B_4	6.92	5.88	6.95	27.81
A_2B_5	11.45	10.05	11.50	45.22
A_3B_1	6.05	5.12	6.14	24.57
A_3B_2	9.10	7.62	9.00	36.54
A_3B_3	12.49	10.68	12.65	49.33
A_3B_4	7.03	6.02	7.08	28.35
A_3B_5	12.91	10.93	12.89	51.29
S.Em±	0.32	0.27	0.32	1.26
CD at 5%	0.92	0.78	0.92	3.65

Yield (kg ha-1)

It's miles inferred from the records supplied in table-4 that all the row spacing is drastically effective in grain yield (kg ha-1). The most yield, harvesting Index and Cost Benifit Ratio turned into recorded in A3 (40×10 cm2) accompanied through A2 (30×10 cm2) and A1 (20×10 cm2). Results also similar with Ahmed (2001) [1] and Tayyab (2000) [15] pronounced elevated grain yield with 30 cm row spacing. The variations in grain yield, harvesting Index and Cost Benifit Ratio amongst various weeding strategies were showed significant impact. The maximum yield harvesting Index and Cost Benifit Ratio recorded in B5 (Imazethapyr @ a hundred g/ha) accompanied by B3 (two hand weeding. The minimum grain yield become obtained in B5 (No weeding) (707 kg).It is also observed by Awan *et al*. (2009) [4] stated that thousand grain weight of mungbean turned into extended with reduction in weeds dry biomass

The interactions among row spacing and weeding were discovered to be good sized. Amongst interplay of mixture of various spacing and weeding strategies, the information presented in table-4, indicated that the very best yield, harvesting Index and Cost Benifit Ratio recorded in the 40×10 cm2 spacing with post emergence herbicide (Imazethapyr @ 100 g/ha) for weed management (A3B5) which was at par with A3B3 (forty×10 cm2 spacing with hand weeding). At 20×10 cm2 spacing, all of the weeding strategies performed considerably poorer over each the spacing (30×10 cm2 and 40×10 cm2). Ahmed (2001) [1] evaluated the performance of plant spacing and said that seed yield, straw yield, harvest index and seed protein content of mungbean were notably motivated with the aid of each Phosphorus degree and row spacing. The minimal grain yield became received with A1B1 (20×10 cm2 spacing without weeding) which turned into at par with A2B1 (30×10 cm2 spacing with out weeding) and A3B1 (40×10 cm2 spacing with out weeding). Crucial reasons for low average yield of mungbean on farmer's field are the continuous cultivation of conventional low capacity cultivars, use of low seed charge and mistaken agronomic practices e.g. Inter-row spacing (Ansari *et al*., 2000) [3]. Akter *et al*. (2013) [2] performed an experiment which is also similar with this Interaction effect.

Table 4: Effect of row spacing and weed management on yields, harvesting index and Cost: Benefit Ratio of mungbean at different days

Treatments	Grain Yield (kg ha^{-1})	Stover Yield (kg ha^{-1})	Biological Yield (kg ha^{-1})	Harvest Index (%)	BCR
Effect of row spacing					
A_1	1128	1887	3017	37.12	1.50
A_2	1131	1938	3066	36.52	1.68
A_3	1226	2037	3263	37.16	2.10
S.Em±	16.81	29.35	46.45	NS	0.03
CD at 5%	48.62	84.88	134.34	NS	0.08
Effect of weed management					
B_1	707	1546	2254	31.37	1.25

B_2	1078	1941	3019	35.72	1.40
B_3	1307	2102	3409	38.30	1.26
B_4	818	1597	2415	33.85	1.35
B_5	1443	2175	3618	39.86	3.03
SEm±	21.70	37.89	59.97	0.69	0.04
CD at 5%	62.76	109.57	173.43	1.99	0.10
Interaction effect of row spacing and weed management					
A_1B_1	665	1505	2170	30.65	0.93
A_1B_2	1124	1891	3015	37.28	1.35
A_1B_3	1235	2001	3236	38.16	1.03
A_1B_4	776	1566	2342	33.13	1.06
A_1B_5	1387	2088	3475	39.91	2.57
A_2B_1	715	1531	2246	31.83	1.26
A_2B_2	1047	1937	2984	35.09	1.34
A_2B_3	1246	2057	3303	37.72	1.15
A_2B_4	823	1593	2416	34.06	1.36
A_2B_5	1395	2164	3559	39.20	2.88
A_3B_1	742	1603	2345	31.64	1.55
A_3B_2	1064	1994	3058	34.79	1.52
A_3B_3	1439	2249	3688	39.02	1.59
A_3B_4	854	1632	2486	34.35	1.64
A_3B_5	1546	2273	3819	40.48	3.63
SEm±	37.59	NS	NS	NS	0.06
CD at 5%	108.71	NS	NS	NS	0.18

Conclusion and Suggestion for Further work

The records on weed parameters were amassed from 10 DAS to at harvest. Weed parameters which include total weed population (no. M-2) and weed biomass (g m-2), boom parameters *viz*., plant top, above floor dry count number weight plant-1, Yield contributing characters and yield parameters like quantity of pods plant-1, seeds pod-1, pod duration, 1000 seeds weight, grain yield, straw yield, organic yield, harvest index of seeds and Economic Parameter like benefit price ratio. Effects found out that plant spacing of mungbean like 40x10 cm2 stand advanced to other in recognize of dry depend content material plant-1, period pod-1, seeds pod-1, seed yield, number of pods plant-1, 1000-seeds weight and harvest index. Amongst weed management practices, the highest plant peak, dry count number content material plant-1, period pod-1, seeds pod-1 variety of pods plant-1, grain yield, straw yield, biological yield and harvest index changed into acquired by means of the utility of submit emergence herbicide at 25 DAS (B5) even as most become received from hand weeding remedy. In combination, it become found that the lowest number of weed species and total wide variety of weeds m-2 was obscured in A1B5 (utility of Imazethapyr @ a hundred g/ha preserving 20x10 cm2 spacing). Alternatively, the very best wide variety of weed species and total number of weeds m-2 was obtained from A3B1. Spacing and weed manage treatments had sizable impact at the yield and yield contributing characters *viz*., duration pod-1, seeds pod-1, one thousand grain weight, grain yield, straw yield, organic yield and harvest index and BCR turned into maximum in 40x10 cm2 with Imazethapyr @ 100 g/ha (A3B5) treatment. It become determined that plant spacing 40x10 cm2 coupled with Imazethapyr @ one hundred g/ha (A3B5) emerged as economically feasible treatment for more yield with maximum BCR. It could be concluded that mungbean crop may be grown giving 40x10 cm2 plant spacing with one time spraying of put up emergence herbicide, Imazethapyr @ one hundred g/ha (A3B5) for better boom with maximum yield attributes of yield harvest which proved economically a viable remedy.

Concept for further work

Within the mild of enjoy received for the duration of the direction of investigation and effects observed it became felt that the subsequent points have to be taken under concerns in similarly studies that is The investigation may be performed with a few other mungbean promising types and Checking out the proper aggregate of bio-fertilizer and organic manure in mungbean must be made for improving the crop yield economically.

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