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 weeding 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, herbicides, 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 a 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 Gram plan. 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 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/ha, available phosphorus 16.6 kg ha⁻¹, available potassium 385 kg ha⁻¹ and were estimated by combined glass electrode pH meter method, Walkley and Black’s rapid titration method, Alkaline permanganate method (Subbaiah and Asija, 1956), Bray’s method (Jackson, 1973), Photometry (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 Cynodon dactylon, Cyperus rotundus, Eleusine indica, Eichinochloa crus-galli 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 noted that the species, Dura (Cynodon dactylon) 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 observed that Weeds compete with main crop for area, nutrients, water and mild. It is also identified that a low weed population 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.

| 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 |
|------------|------------------------|------------------------------------------|-----------------------------------------------------------|
| A1B1       | 11.84                  | 224.10                                   | 367.55                                                   |
| A1B2       | 10.22                  | 101.97                                   | 177.99                                                   |
| A1B3       | 12.05                  | 160.09                                   | 232.00                                                   |
| A1B4       | 9.48                   | 87.43                                    | 131.26                                                   |
| A1B5       | 7.98                   | 72.99                                    | 102.13                                                   |
| A2B1       | 12.29                  | 243.68                                   | 377.66                                                   |
| A2B2       | 8.82                   | 141.76                                   | 193.33                                                   |
| A2B3       | 10.56                  | 130.20                                   | 191.12                                                   |
| A2B4       | 10.87                  | 94.36                                    | 121.23                                                   |
| A2B5       | 9.27                   | 77.87                                    | 97.17                                                    |
| A3B1       | 12.83                  | 258.14                                   | 389.17                                                   |
| A3B2       | 9.92                   | 150.69                                   | 183.24                                                   |
| A3B3       | 7.22                   | 172.91                                   | 195.20                                                   |
| A3B4       | 10.03                  | 95.29                                    | 119.42                                                   |
| A3B5       | 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 matter 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 B3 (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 different days

| 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 | |
| A₁ | 0.20 | 0.88 | 2.54 | 7.83 | 10.03 | 10.07 |
| A₂ | 0.21 | 0.93 | 2.70 | 8.05 | 10.41 | 10.63 |
| A₃ | 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 | |
| B₁ | 0.18 | 0.57 | 1.67 | 5.01 | 6.44 | 6.74 |
| B₂ | 0.20 | 0.82 | 2.58 | 7.44 | 9.81 | 10.12 |
| B₃ | 0.21 | 1.08 | 3.18 | 9.41 | 12.20 | 12.59 |
| B₄ | 0.19 | 0.67 | 1.85 | 5.94 | 7.55 | 7.91 |
| B₅ | 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

| A₁B₁ | T1 | 0.17 | 0.54 | 1.62 | 4.89 | 6.16 | 6.19 |
| A₁B₂ | T2 | 0.19 | 0.81 | 2.40 | 7.28 | 9.56 | 9.60 |
| A₁B₃ | T3 | 0.20 | 0.99 | 2.92 | 8.86 | 11.14 | 11.19 |
| A₁B₄ | T4 | 0.18 | 0.64 | 1.75 | 5.74 | 7.23 | 7.27 |
| A₁B₅ | T5 | 0.22 | 1.09 | 3.10 | 9.44 | 12.17 | 12.20 |
| A₂B₁ | T6 | 0.18 | 0.58 | 1.68 | 4.97 | 6.51 | 6.54 |
| A₂B₂ | T7 | 0.20 | 0.86 | 2.64 | 7.38 | 9.84 | 9.88 |
| A₂B₃ | T8 | 0.21 | 1.04 | 3.09 | 8.99 | 11.77 | 11.83 |
| A₂B₄ | T9 | 0.19 | 0.65 | 1.88 | 5.83 | 7.64 | 7.68 |
| A₂B₅ | T10 | 0.23 | 1.12 | 3.19 | 9.98 | 12.39 | 13.14 |
| A₃B₁ | T11 | 0.19 | 0.60 | 1.71 | 5.16 | 6.64 | 7.48 |
| A₃B₂ | T12 | 0.21 | 0.89 | 2.69 | 7.67 | 10.04 | 10.88 |
| A₃B₃ | T13 | 0.22 | 1.21 | 3.54 | 10.40 | 13.69 | 14.75 |
| A₃B₄ | T14 | 0.20 | 0.68 | 1.91 | 6.23 | 7.79 | 8.78 |
| A₃B₅ | 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) [12] 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 quinalofop-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 different days

| Treatments | Pods plant⁻¹ (no.) | Pod length (cm) | Seeds pod⁻¹ (no.) | 1000-seeds weight (g) |
|------------|---------------------|-----------------|-------------------|-----------------------|
| A₁         | 9.01                | 7.67            | 9.07              | 35.56                 |
| A₂         | 9.45                | 8.11            | 9.49              | 37.78                 |
| A₃         | 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 row spacing

| CD at 5%   | 0.41                | 0.35            | 0.41              | 1.63                  |

Effect of weed management

| Treatments | Pods plant⁻¹ (no.) | Pod length (cm) | Seeds pod⁻¹ (no.) | 1000-seeds weight (g) |
|------------|---------------------|-----------------|-------------------|-----------------------|
| B₁         | 5.84                | 4.96            | 5.89              | 23.56                 |
| B₂         | 8.72                | 7.37            | 8.71              | 35.04                 |
| B₃         | 11.09               | 9.43            | 11.16             | 44.24                 |
| B₄         | 6.83                | 5.82            | 6.87              | 27.49                 |
| B₅         | 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

| Treatments | Pods plant⁻¹ (no.) | Pod length (cm) | Seeds pod⁻¹ (no.) | 1000-seeds weight (g) |
|------------|---------------------|-----------------|-------------------|-----------------------|
| A₁B₁       | 5.58                | 4.74            | 5.60              | 22.42                 |
| A₁B₂       | 8.30                | 7.04            | 8.33              | 33.34                 |
| A₁B₃       | 10.10               | 8.57            | 10.13             | 40.55                 |
| A₁B₄       | 6.55                | 5.56            | 6.57              | 26.32                 |
| A₁B₅       | 11.09               | 9.52            | 11.25             | 42.03                 |
| A₂B₁       | 5.90                | 5.01            | 5.92              | 23.69                 |
| A₂B₂       | 8.77                | 7.44            | 8.80              | 35.23                 |
| A₂B₃       | 10.67               | 9.05            | 10.70             | 42.84                 |
| A₂B₄       | 6.92                | 5.88            | 6.95              | 27.81                 |
| A₂B₅       | 11.45               | 10.05           | 11.50             | 45.22                 |
| A₃B₁       | 6.05                | 5.12            | 6.14              | 24.57                 |
| A₃B₂       | 9.10                | 7.62            | 9.00              | 36.54                 |
| A₃B₃       | 12.49               | 10.68           | 12.65             | 49.33                 |
| A₃B₄       | 7.03                | 6.02            | 7.08              | 28.35                 |
| A₃B₅       | 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) [1] 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) [1] 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) [1]. Akter et al. (2013) [1] 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
| A₁         | 1128                  | 1887                   | 3017                      | 37.12             | 1.50 |
| A₂         | 1131                  | 1938                   | 3066                      | 36.52             | 1.68 |
| A₃         | 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

| Treatments | Grain Yield (kg ha⁻¹) | Stover Yield (kg ha⁻¹) | Biological Yield (kg ha⁻¹) | Harvest Index (%) | BCR |
|------------|-----------------------|------------------------|---------------------------|-------------------|-----|
| B₁         | 707                   | 1546                   | 2254                      | 31.37             | 1.25 |
Conclusion and Suggestion 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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