Effect of different weed management practices and row spacing in yield and yield attributing characteristics of green gram (*Vigna radiata* L. Wilczek)

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Abstract

The study was conducted to evaluate the effect of different weed management practices and row spacing in yield and yield attributing characteristics of green gram (*Vigna radiata* L. Wilczek) during spring season, 29th Feb – 24th May, 2020 in Duduwa, Banke, Nepal. Nine treatment combinations consisting of three weed management treatments (W_1: Control (no weeding), W_2: Pre-emergence application of Pendemethalin at a rate of 1lit.ha^{-1}, and W_3: Hand weeding at 30 DAS (Days after sowing)) and three row spacing (S_1: 30 cm × 10 cm, S_2: 40 cm × 10 cm, S_3: 50 cm × 10 cm) were tested by deploying factorial randomized block design (FRBD) with three replications. The plant height (55.73 cm), Number of pods per plant (43.00), Number of seeds per pod (10.83), and 100 grain weight (7.08 gm.) was recorded more in W_3. Dry weight of weeds (9.39 gm. m^{-2}) was recorded more in W_2. More seed yield (1136 kg. ha^{-1}) and biological yield (3222 kg. ha^{-1}) were found in W_1. Significantly, the plant population during 16 DAS (43.72 plant. m^{-2}) and during 86 DAS (42.17 plant. m^{-2}), and plant height (57.73 cm) and 50 % flowering (51.44 days) were the highest in the treatment S_1. However, days to maturity, number of pods per plant and 100 grain weight did not show any significant differences to the various row spacing. The dry weight of weeds (7.93 gm. m^{-2}) and number of seeds per pod (10.57) were found more in the treatment S_3. However, more seed yield (1120 kg. ha^{-1}) and biological yield (3240.11 kg. ha^{-1}) were found in the treatment S_1. To achieve more profitable yield of spring green gram, the crop should be sown at 30 cm x 10 cm spacing and followed by pre-emergence application of Pendimethalin at a rate of 1lit.ha^{-1} coupled with hand weeding at 30 DAS.

Key words: green gram, weed management, row spacing, yield.

Introduction

Green gram (*Vigna radiata* L. Wilczek) is the most economically important pulse crop cultivated in irrigated/ partially-irrigated area in the terai, inner terai and warm valleys mainly as a spring season crop in rice-wheat-moonbeam pattern (Neupane *et al*., 2003). Green gram occupies leading position

among the various pulse crops, due to its short growth period, high production capacity and outstanding nutrient value as food and forage. Green gram provides an excellent opportunity to replace fallow land with a crop and contribute to the food and nutritional security of millions of households in Nepal. Short duration green gram varieties can be attractive options in multiple cropping areas as nearly 80% of their pods can be harvested within 70–75 days after sowing and thus do not delay the transplanting of main season rice. The incorporation of green gram biomass in the soil improves overall soil properties by contributing to soil organic matter and to the nitrogen economy through symbiotic nitrogen fixation (Sharma *et al*., 2000; Rao, 2005).

Weed management is an important key factor for boosting the productivity of green gram, as weeds compete for water, nutrient, space and light with crop plants during early growth period and also harbors the pest and diseases (Kumara *et al*., 2021). Manual weeding at right time is an efficient method for suppressing the weeds and increasing the growth and yield attributes of greengram (Vinutha, 2015; Tamang *et al.,* 2015; Verma *et al.,* 2017; Leva *et al.,* 2018 ;) along with stover weight (Chhodavadia et al., 2012) and harvest index (Merga and Alemu, 2019). The plots with manual weeding record maximum plant height in lentil (Sadiq *et al.,* 2002) and in direct seeded rice (Akbar et al., 2011) while minimal height in unweeded plot (Akter *et al.,* 2013). Weed management practices also affect the density of weeds where the number of weeds found more in unweeded plot than that of manual weeding and weedicides treated plot in green gram (El-Samie *et al.,* 2018; Kumar *et al.,* 2019; Osari *et al.,* 2019 and Rambilash *et al.,* 2020).

The most important agronomic practice is the maintenance of optimum row spacing of plant which is responsible for determining effective population density to increase growth and yield parameters of greengram crop (Wubetu, 2018). The plant population per unit area are influenced by the row spacing (Chandubhai, 2015) thus optimum row spacing plays a vital role in contributing to the high yield which ensures proper utilization of light, moisture and nutrient for better performance of plants in the community (Mohaddesi *et al.,* 2011). On the other hand, Plant population with high density and closer spacing obstruct intercultural operation, increases competition among the plants for nutrient, air, light and moistures for photosynthesis which results in weaker and thinner plants consequently reducing grain yield and thus favors more straw yield while plant population with very low density will also reduce the yield of grain (Sultana *et al*., 2012; Alam *et al*., 2012; Rasul et al., 2012; Kumari et al., 2020).

The key objective of this field experiment was to investigate the potency of various weed management practices and the efficacy of suitable row spacing in relation to green gram production per unit area.

Materials and Methods

Site description

The research was conducted in Shivarajpur village, Duduwa Rural Municipality 05, Banke during the period from February to May in 2020. The research site is located at latitude 28.044203^0 N and longitude 81.697494^0 E with an elevation of 150 m above the sea level.

Plant material, seed sowing and harvesting

The green gram variety "Pratigya" registered by the National Seed Board developed by Nepal Agricultural Research Council (NARC) in 2018 were directly sown in the field after preparing the land in 29 Feb, 2020 in each experimental plot at the depth of 4-5 cm in the soil. Seed was sown according to the treatments maintaining the appropriate row spacing of 30×10 cm, 40×10cm and 50×10 cm in a randomized block design. Pre-emergence application of Pendimethalin was done in the plot as per the treatment. After ten day of sowing, thinning was carried out by

keeping the plant to plant distance of about 10 cm within row. Various operations such as thinning were done in each plot after the germination of seed in 10 March, 2020 and weeding was done at 30 DAS as per the treatment. Harvesting of crop was done at 86 DAS.

Data collection

Five plants from each experimental plot were randomly selected as sample plants for data collection of plant height (cm), days to 50 % flowering, number of pods per plant, number of seeds per 10 pods, 100 grain weight (g), seed yield (Kg.ha^{-1}) and harvest index (%). Plant population (plant.m^{-2}) was calculated by counting the number of plants in 1 m^2 area by quadrate.

A) Growth attributes

Plant Population: Plant population was recorded at 16 DAS and at the time of harvest of crop at 86 DAS.

Plant height (cm): Plant height was recorded at 65 DAS from five plants selected and tagged from the plot of each treatment and measured from the ground level to the top of the selected plants in centimeter. The average value was calculated and recorded accordingly.

Days to 50 % flowering: The number of days from date of sowing to 50 % flowering was recorded from the selected plants of each plot.

Days to maturity: The number of days from date of sowing to maturity was recorded from the selected plants of each plot.

B) Yield and Yield attributes

The number of pods per plant: The total number of pods collected from 5 tagged plants was counted and the average value per plant was worked out and recorded for each treatment.

Number of seeds per 10 pods: Randomly selected ten pods from 5 tagged plants were used for counting the number of seeds per pod for each treatment.

100-grain weight (g): One hundred seeds were counted from the random sample drawn from each plot yield and their weight was recorded for the respective treatments (Gurjar *et al.*, 2018).

Seed yield (kg. ha^{-1}): The produce of each net plot was threshed separately, cleaned and the seed yield was recorded in grams per net plot. The seed yield received per net plot was then converted on Kg. ha^{-1} basis.

Harvest Index (%): Harvest index was calculated by using following formula.

$$\text{Harvest Index (\%)} = \frac{Economic\ yield(\frac{kg}{ha})}{Total\ Biomass\ yield(\frac{kg}{ha})} \times 100$$ (Amanullah and Inamullah, 2016)

C) Weed parameter

Dry weight of weeds (g. m^{-2}): The weed samples were collected at 32 DAS from 0.5 m^2 area of the net plot of each treatment. Collected weed samples were sun dried first and then dried in an electrical air oven at 60 ˚C for 24 hours till constant weight was obtained.

Experimental designs

The experiment was laid out in the factorial randomized block design (FRBD) with two factors consisting of nine treatments (Table 1) and three replications. There are altogether 27 plots. Distance between blocks and plots were kept 1 m and 0.5 m respectively. Each plot size was 3×2 m^2 and the total area was 248 m^2.

Treatments

Factor-I: Weed management Practices (W)	**Factor-II: Row Spacing (S)**
W_1: Control (no weeding)	S_1: 30 cm×10 cm
W_2: Pre-emergence application of Pendimethalin 1 lit. ha^{-1}	S_2: 40 cm× 10 cm
W_3: Hand weeding at 30 DAS	S_3: 50 cm×10 cm

Table (1): Treatment details with their symbols

Treatment	Symbol	Treatment details
T_1	$W_1 S_1$	Control (no weeding)+ 30 × 10 cm^2
T_2	$W_1 S_2$	Control (no weeding)+ 40 × 10 cm^2
T_3	$W_1 S_3$	Control (no weeding)+ 50 × 10 cm^2
T_4	$W_2 S_1$	Pre emergence application of Pendimethalin + 30 × 10 cm^2
T_5	$W_2 S_2$	Pre emergence application of Pendimethalin + 40 × 10 cm^2
T_6	$W_2 S_3$	Pre emergence application of Pendimethalin +50 × 10 cm^2
T_7	$W_3 S_1$	Hand weeding at 30 DAS + 30 × 10 cm^2
T_8	$W_3 S_2$	Hand weeding at 30 DAS + 40 × 10 cm^2
T_9	$W_3 S_3$	Hand weeding at 30 DAS +50 × 10 cm^2

Statistical analysis

The collected data were compiled using the MS-Excel program. Analysis of variance (ANOVA) for all parameters was carried out as per the procedures given in R-studio (version 1.3.1073.0), statistical computer package for the two factors randomized block design. Duncan's Multiple Range Test (DMRT) for mean separations was done at 0.05 level of significance. Statistical analysis of data was done by converting them into $\sqrt{(x+0.5)}$ as suggested by (Gomez and Gomez, 1984) which is useful for normalizing a skewed distribution, transforming a non-linear relationship between two variables into a linear one and reducing heteroscedasticity of the residuals in linear regression.

Result and Discussion

Growth attributes

Effect of weed management practices on growth and growth attributes

Initial and final plant populations of green gram were not significantly affected due to the various weed management practices (Table 2). From the data, it was verified that the plant population in all treatments were uniform which indicated that variation in vegetative and reproductive attributes as well as yield was mainly due to treatments effect only and not due to the plant population of green gram. This finding is in a complete agreement with earlier work by (Chandubhai, 2015) in green gram who reported that initial and final plant populations were not significantly affected due to similar various weed management practices.

Growth parameter like plant height was significantly influenced by various weed management treatments. Significantly, the highest plant height was observed in the treatment W_3 (Hand weeding at 30 DAS) being at par with treatment W_2 (Pre-emergence application of Pendimethalin at a rate of 1lit. ha^{-1}) and superior to the treatment W_1 (control; no weeding). This might be due to better availability of nutrient, moisture, space and light. The results are in conformity with the observations of (Sadiq *et al*., 2002) in lentil and (Akbar *et al.*, 2011) who recorded the maximum height of rice (95.97 cm) in weed control through manual pulling than mechanical hoeing using kasola and various weedicides. Similarly, (Sadiq *et al*., 2002) also revealed the maximum height of lentil (59.51 cm) in hand weeding treatment than pre and post emergence herbicides. The lowest plant height in the control might be due to more inter-competition between the crop and weed for light, nutrient, moisture and space. This result was in conformity with observations of (Akter *et al*., 2013) who reported the shortest plant height (19.54 cm) of mungbean was obtained at 50 DAS from no weeding treatment. Likewise, (Aktar *et al*., 2015) also found the minimal height of mungbean (40.13 cm) in unweeded control treatment.

Various weed management practices did not reach to the level of significance for days to 50 % flowering and days to maturity (Table 2). Similar observations also observed by (Chandubhai, 2015) in green gram who stated weed management treatments did not exert any significant influence on days to 50 % flowering and days to maturity.

Effect of row spacing on growth and growth attributes

Data on initial and harvest were significantly influenced by row spacing (Table 2) thus, the plant population in all treatments were different which indicated that variation in vegetative and reproductive attributes as well as yield was mainly due to the plant population of green gram. Plant height was influenced by row spacing at 65 DAS. The highest plant height was recorded under treatment S_1 (30 cm × 10 cm) followed by S_2 (40 cm × 10 cm) and S_3 (50 cm × 10 cm). This was clear that the individual plant from the plots with narrow spacing did not get opportunity to proliferate laterally due to the less lateral space. Hence, plants were forced to grow more in upward direction for the fulfillment of light requirement for photosynthesis. Similar result was also observed in green gram by Chandubhai, 2015 who reported the highest plant height under S1 (30 cm x 10 cm) than treatment S2 (45 cm x 10 cm) and S3 (60 cm × 10 cm) at 60 DAS and at harvest. Similarly, (Kumari *et al.*, 2020) also found the similar result that maximum height of green gram (41.33 cm) in closer spacing (20 cm × 15 cm) than wider spacing (40 cm × 15 cm). Various row spacing reaches to the level of significance for days to 50 % flowering but did not reach to the level of significance for days to maturity (Table 2). These results were found nearly conformable with the finding of (Wubetu, 2018) who also reported that days to maturity in mungbean was almost same to all row spacing while days to 50 flowering was more in wider spacing.

Table 2: Effect of different weed management practices and row spacing on growth attributes of green gram.

Treatments	Plant population (m^2)		Plant height (cm)	Days to 50 % flowering	Days to maturity
	16 DAS	86 DAS			
Weed management practices (W)					
W_1: Control (no weeding)	33.74^a	32.11^a	51.73^b	53.89^a	81.22^a
W_2: Pre- emergence application of Pendimethalin at a rate of 1lit.ha^{-1}	36.52^a	35.30^a	52.20^{ab}	51.78^a	80.89^a
W_3: Hand weeding at 30 DAS	34.50^a	32.02^a	55.73^a	52.67^a	82.22^a
F-Test	NS	NS	S	NS	NS
Row Spacing (S)					
S_1: 30 cm × 10 cm	43.72^a	42.17^a	57.73^a	51.44^b	81.33^a
S_2: 40 cm × 10 cm	35.00^b	33.24^b	52.36^b	54.56^a	81.33^a
S_3: 50 cm × 10 cm	26.04^c	25.02^c	49.58^b	52.33^{ab}	81.67^a
F-Test	S	S	S	S	NS
Interaction	NS	NS	NS	NS	NS
LSD(0.05)	6.16	6.13	3.8	2.79	2.09
C. V. %	17.67	18.32	7.15	5.28	2.57
Grand Mean ± SEm	34.92±0.08	33.48±0.08	53.22±0.05	52.78±0.03	81.44±0.03

CV: Coefficient of variation; S: Significant; NS: Non-significant; SEm: Standard Error of mean, LSD: Least Significant Difference, DAS: Days after sowing.

Yield and Yield attributes

Effect of weed management practices on yield and yield attributes

Various yield attributes like number of pods per plant, number of seeds per pod, 100 grain weight, seed yield, biological yield and harvest index play vital role in increasing the productivity of green gram crop. The entire yield attributing characteristics (Table 3) were significantly influenced by various weed management practices. Treatment W_3 (Hand weeding at 30 DAS) recorded the highest number of pods per plant (43.00) which was significantly superior to W_1 (control). Treatment W_3 recorded the highest number of seeds per pod (10.83) followed by treatment W_2 while the lowest number of seeds per pod was observed in the treatment W_1. The present results are in a close association with the findings of Leva *et al*., 2018 who revealed that minimum number of pods per plant (10.76) in unweeded control plot and maximum (17.90) in two hands weeding and inter-culturing at 20 and 40 DAS respectively in green gram. Similarly, Vinutha, 2015 also recorded highest number of pods per plant and seeds per pod in hand weeded plots than weedicides treated plot in Pigeon pea and consequently lowest in unweeded plots.

The results showed that weed management treatments had a significant effect on 100 grain weight of green gram (Table 3). Treatment W_3 recorded the highest 100 grain weight (7.08 g) being at par with treatment W_2. The lowest 100 grain weight was recorded under treatment W_1 which was statistically at par with the treatment W_2. The result is closely conformable with findings of Tamang *et al*., 2015 and Verma *et al*., 2017 who reported the maximum weight of 1000-grain weight of green gram (41.20 gm. and 32.19 gm. respectively) in hand weeding plot at 20 and 40 DAS followed by Pendimethalin treated plot (40.70 gm. and 31.05 gm. respectively) and lowest at weedy check plot (39.89 gm. and 29.54 gm. respectively).

Also, weed management treatments had a significant effect on seed and biological yield (Table 3). The highest seed and biological yield (1136 kg ha^{-1} and 3222 kg ha^{-1} respectively) was recorded in the treatment of W_2 which was followed by W_3 and the control (W_1) respectively. The remarkable increase in seed and biological yield in treatments (W_2 and W_3) could be due to effective control of weeds in terms of reduced dry weed weight, which facilitated the crop to utilize more nutrients and moisture for better growth and development of plant. These findings are in close with the results of (Chhodavadia *et al*., 2012 and Chandubhai, 2015) in green gram who reported the maximum grain and stover weight in two hand weeding at 20 and 40 DAS (977 kg ha^{-1} & 1376 kg ha^{-1} and 1210 kg ha^{-1} & 2398 kg ha^{-1} respectively) followed by pendimethalin treated plot(768 kg ha^{-1} & 1131 kg ha^{-1} and 892 kg ha^{-1} & 1802 kg ha^{-1} respectively and unweeded check plots(659 kg ha^{-1} & 1068 kg ha^{-1} and 540 kg ha^{-1} & 1307 kg ha^{-1} respectively.

Different weed management treatments influenced significantly on harvest index of green gram as shown in table 3. The highest harvest index (35.25 %) was recorded in the treatment of W_2 which was significantly superior to the control (W_1) and W_3 respectively. This finding is in a close agreement with the results of Merga and Alemu, 2019 who reported the highest harvest index in Pendimethalin treated plot than other treatments.

Effect of row spacing on yield and yield attributes

The yield attributing characteristics such as the number of seeds per pod, seed yield, biological yield and harvest index were significantly influenced by the row spacing while other characteristics like number of pods per plant and 100 grain weight (gm.) were not significantly influenced by the row spacing (Table 3).

The effect of different row spacing on the number of pods per plant was found non-significant. However, the highest number of pods per plant was recorded in the treatment S_3 (40

pods per plant) and the lowest number of pods per plant was recorded in S_1 (36.37 pods per plant). While the effect of different row spacing on number of seeds per pod was found significant. The highest number of seeds per pod was recorded in the treatment S_3 (10.57) which were significantly superior to S_2 and S_1 (9.9 and 9.82 seeds per pod respectively). The results showed that different row spacing treatments had insignificant effect on the 100 grain weight of green gram. Anyway, the highest 100 grain weight was recorded in the treatment S_3 (7.11 gm.). Almost similar results were observed by (Rasul *et al*., 2012 who reported highest pods per plant (16.97), seeds per pod (10.55) and 100 grain weight (49.30) in inter-row spacing of 60 cm than row spacing of 45 cm and 30 cm in mungbean. Similarly, Chandubhai, 2015 also recorded maximum pods per plant (21.56); seeds per pod (8.26) and 1000-grain weight (42.50 g) in wider spacing of 60 cm × 10 cm) than narrower spacing.

The effect of different row spacing on seed and biological yield of green gram was significant. The results presented in Table 3 showed that the highest seed and biological yield (1120 and 3240.11 kg respectively) was recorded in the treatment S_1 which was significantly superior to both S_2 and S_3. Due to the narrow spacing, the plant populations are more than the wider spacing. It clearly indicated that lower plant population per unit area under wider spacing cannot compensate the reduction in total yield. Similar observations recorded by Rasul *et al*., 2012 and Chandubhai, 2015 in mungbean that maximum Biological and seed weights were recorded in narrower row spacing than wider row spacing. Similarly, Wubetu, 2018 also found the similar result that highest grain weight and stover weight in inter-row spacing of 25 cm than inter-row spacing of 30 cm, 35cm and 40 cm respectively in mungbean.

Also, the effect of different row spacings on harvest index of green gram was found significant. The highest harvest index was recorded in the treatment S_1 (34.55 %) which was significantly superior to the treatment S_3 (32.56 %). These results are similar to the observations of (Chandubhai, 2015; Wubetu, 2018).

Table 3: Effect of different weed management practices and row spacing on yield and yield attributes of green gram.

Treatments	Number of pods per plant	Number of seeds per pod	100 grain weight (gm.)	Seed yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest Index (HI %)
Weed management practices (W)						
W_1: Control (no weeding)	34.51^{b}	9.34^{c}	6.66 ^{b}	892.78^{b}	2732.67^{c}	32.59^{b}
W_2: Pre- emergence application of Pendimethalin at a rate of 1lit. ha^{-1}	37.37^{a}	10.11^{b}	7.01^{ab}	1136^{a}	3222^{a}	35.25^{a}
W_3: Hand weeding at 30 DAS	43.00^{a}	10.83^{a}	7.08 ^{a}	983.67^{b}	2964.22^{b}	33.13^{b}
F-Test	S	S	S	S	S	S
Row Spacing (S)						
S_1: 30 cm × 10 cm	36.37^{a}	9.82^{b}	6.7 ^{a}	1120^{a}	3240.11^{a}	34.55^{a}
S_2: 40 cm × 10 cm	38.52^{a}	9.90^{b}	6.94 ^{a}	996.56^{b}	2958.33^{b}	33.56^{a}^{b}
S_3: 50 cm × 10 cm	40.00^{a}	10.57^{a}	7.11^{a}	895.89^{c}	2720.44^{c}	32.85^{b}

F-Test	NS	S	NS	S	S	S
Interaction	NS	NS	NS	NS	NS	NS
LSD(0.05)	6.16	0.54	0.48	95.92	191.38	1.43
C. V. %	16.09	5.42	7.11	9.77	6.58	4.24
Grand Mean ± Sem	38.29 ±0.08	10.09± 0.001	6.92± 0.01	1004.15 ±1.21	2972.96 ±2.42	33.66 ±0.02

CV: Coefficient of variation; S: Significant; NS: Non-significant; SEm: Standard Error of mean, LSD: Least Significant Difference, DAS: Days after sowing.

Dry weed weight

Effect of weed management practices on dry weed weight

Different weed management treatments significantly influenced the dry weight of weeds at 32 DAS (Table 4). The highest dry weight of weeds was recorded in the control (W_1) which was significantly superior to W_3 and W_2. These findings are in a close agreement with the findings of Kumar *et al.*, 2019; Osari *et al*., 2019 and Rambilash *et al*., 2020 in green gram that maximum dry weed weight (67.27 gm.m^2 and 9.67 gm. m^2 respectively) was recorded in weedy check than two manual weeding plots at 20 and 35-40 DAS and lowest at plot treated with Pendimethalin at a rate of 1.0 kg ha^{-1}.

Effect of row spacing on dry weed weight

Different row spacing treatments significantly influenced the dry weight of weeds at 32 DAS. The highest dry weight of weeds (7.93 gm.) was recorded in the treatment S3 which remained at par with treatment S_2 but was significantly superior to S_1 (Table 4). The reason for the increased dry weed weight is due to the wider space for weed growth between the rows of crops. These results confirmed by Chandubhai, 2015 in green gram who reported maximum dry weed weight (11.63 gm.m^{-2}) under treatment of 60 cm x 10 cm but remained at par with treatment of 45 cm x 10 cm and lowest (10.97 gm.m^{-2}) under treatment of 30 cm x 10 cm spacing at harvest. Similarly, El-Samie *et al.*, 2018 also illustrated the similar finding that the narrowest row spacing (15cm) decreased the dry weight of total weeds by 42.22 and 43.29 gm.m^{-2} in first and second seasons, respectively, compared to wide row spacing (25 cm) in wheat.

Table 4: Effect of different weed management practices and row spacing on dry weed weight of green gram.

Treatments	Dry weed weight (gm.m^{-2})
Weed management practices (W)	
Control (no weeding)	9.39^a (3.12)
Pre- emergence application of Pendimethalin at a rate of 1lit. ha^{-1}	3.34^c (1.95)
Hand weeding at 30 DAS	6.11^b (2.55)
F-Test	S
Row Spacing (S)	
S_1: 30 cm × 10 cm	4.78^b (2.26)
S_2: 40 cm × 10 cm	6.13 ^{ab} (2.52)
S_3: 50 cm × 10 cm	7.93^a

	(2.83)
F-Test	S
Interaction	NS
LSD(0.05)	2.69
C. V. %	19.76
Grand mean ± SEm	6.28 ± 0.03

CV: Coefficient of variation; S: Significant; Ns: Non-significant; SEm: Standard Error of mean, LSD: Least Significant Difference, DAS: Days after sowing, Figure in parenthesis are √(x+0.5) transformation.

Interaction effect of weed management practices and row spacing

All the growth and yield attributes, seed and biological yield, dry weed weight remained significantly non-affected due to interaction effect of row spacing and weed management practices (Table 2, 3 and 4). Similar result was also found by Chandubhai, 2015 in his research that the interaction effect of weed management practices and row spacing did not affect the growth and yield attributes of green gram.

Conclusion

The growth attributing characters (initial and final plant populations of green gram, days to 50 % flowering and maturity) were not significantly affected due to the various weed management practices. However, plant height and the yield attributing characteristics like the number of pods per plant, number of seeds per pod, 100 grain weight were found higher in hand weeding at 30 DAS. The dry weight of weeds was recorded more in the control plot. The seed yield, biological yield and harvest index of green gram were observed more in pre-emergence application of Pendimethalin at a rate of 1lit. ha^{-1}. Similarly, the plant population, plant height and early 50 % flowering were recorded more in narrower row spacing of 30 cm × 10 cm while, there was no significant result of different row spacing on days to maturity. The number of pods per plant, seeds per pod, 100 grain yield and dry weed weight were found more in wider row spacing of 50 cm × 10 cm than narrower row spacing. However, seed yield, biological yield and harvest index were recorded maximum in row spacing of 30 cm × 10 cm.

All the growth and yield attributes, seed and biological yield, dry weed weight of crop remained non-significant due to interaction effect of row spacing and weed management practices. Therefore, this study suggested that to achieve more profitable yield of spring green gram, the crop should be sown at spacing of 30 cm x 10 cm followed by pre- emergence application of Pendimethalin at a rate of 1lit/ha as pre emergence coupled with hand weeding at 30 DAS.

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تأثير المعاملات المختلفة للسيطرة على الأعشاب ومسافات الزراعة في إنتاجية ومواصفات الغلة لمحصول للماش الأخضر (*Vigna radiata* L. Wilczek)

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الملخص

أجريت الدراسة لتقييم تأثير المعاملات المختلفة للسيطرة على الأعشاب ومسافات الزراعة في إنتاجية ومواصفات الغلة لمحصول الماش الأخضر (*Vigna radiata* L. Wilczek) في الموسم الربيعي ، 29 شباط – 24 أيار عام 2020 في دودوا، بانكي، نيبال. احتوت التجربة عاملين متغيرين و 9 معاملات تتضمن 3 معاملات للسيطرة على الأعشاب (W_1: تطبيق Pendemethalin قبل الإنبات بمعدل 1 لتر.هكتار$^{-1}$، W_2: الشاهد (عدم إزالة الأعشاب الضارة) و W_3: إزالة الأعشاب الضارة يدويًا بعد 30 يوماً من زراعة البذور) و 3 مسافات زراعة (S_1: 30 سم× 10 سم، S_2: 40 سم × 10 سم و S_3: 50 سم × 10 سم) وفق نظام القطاعات العشوائية (FRBD) مع ثلاثة مكررات. أكبر ارتفاع للنبات (55.73 سم)، عدد القرون في النبات (43)، عدد البذور في القرن (10.83)، ووزن 100 بذرة (7.08 غ) سجّل في معاملة التعشيب اليدوي. أكبر وزن جاف للأعشاب (9.39 غ.م$^{-2}$) كان في معاملة الشاهد. أكبر غلة للبذور (1136 كغ. هكتار$^{-1}$) والغلة من الكتلة الحيوية للنبات (3222 كغ. هكتار$^{-1}$) كانت في معاملة المكافحة الكيميائية للأعشاب. كانت الكثافة النباتية خلال 16 يوماً (43.72 نبات.م$^{-2}$) وخلال 86 يوماً (42.17 نبات.م$^{-2}$)، طول النبات (57.73 سم) وموعد إزهار 50% من البراعم الزهرية (51.44 يوماً) أكبر معنوياً في مسافة الزراعة S_1 (30 سم × 10 سم). على أية حال، كانت الفروق غير معنوية بين معاملات مسافات الزراعة فيما يخص أيام النضج، عدد القرون في النبات ووزن 100 بذرة. كان الوزن الجاف للأعشاب (7.93 غ. م$^{-2}$) وعدد البذور في القرن (10.57 أكبر في المعاملة S_3. على أية حال، أكبر غلة للبذور (1120 كغ. هكتار$^{-1}$) والكتلة الحيوية من النبات (3240.11 كغ. هكتار$^{-1}$) كانت في المعاملة S_1. لتحقيق عائد أكثر ربحية من الماش الأخضر الربيعي، يجب أن تُزرع البذور بمسافة 30 سم × 10 سم ويتبعها تطبيق Pendimethalin قبل الإنبات بمعدل 1 ليتر. هكتار$^{-1}$ مع إزالة الأعشاب الضارة باليد بعد 30 يوماً من الزراعة.

الكلمات المفتاحية: الماش الأخضر، إدارة الأعشاب، مسافات الزراعة، الغلة.