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Effect of weed management practices on growth and productivity of pigeonpea under greengram/blackgram intercropping systems

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Abstract

The field experiment was conducted at Agriculture Farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.) during the *kharif* 2016 and 2017 to assess the growth and productivity of pigeonpea under intercropping systems and weed management. The three intercropping system *viz.* sole pigeonpea, pigeonpea + greengram (2:2) and Pigeonpea + greengram (2:2) and seven weed management treatments *viz.* W₁: Weedy check, W₂: Pendimethalin 30 EC@ 1 kg a.i./ha, W₃: Oxyfluorfen @ 0.2 kg a.i./ha, W₄: Imazethapyr @ 0.1 kg a.i./ha, W₅: Sodium Acifluorfen 16.50% EC+ Clodinofof-propargyl 8% EC, W₆: Pendimethalin 30%+ imazethapyr 2% and W₇: Imazamox35% a.e.+ imazethapyr 35% were comprised in Split Plot design replicated as three. In intercropping system, plant height (149.84 cm), plant dry weight (41.0 g), seed yield (10.83 q/ha) and stover yield (26.94 q/ha) of pigeonpea were recorded significantly higher under sole pigeonpea followed by statistical at par with pigeonpea + greengram (2:2) intercropping system. In weed control practices, plant height, plant dry weight, primary branches and secondary branches/plant and seed yield (12.43 and 12.38 q/ha) of pigeonpea was recorded significantly higher under W₆, pendimethalin 30% + imazethapyr 2% @ 1kg/ha followed by W₇, Imazamox 35% + imazethapyr 35% @ 30g/ha.

Keywords: Growth, intercropping system, pigeonpea, productivity, weed control practices

Introduction

Pulses are the main source of protein in the Indian diet where majority of the population comes under vegetarian category. Steady increase in the population taken together with the stagnant production of pulses over the decades resulted in insufficiency in calories and imbalance in nutritional supply. Pigeonpea is one of the major pulse crops only next to chickpea in India which is cultivated in 19 percent of the gross cropped area under pulses and providing 23 percent of the national pulse production (Sharma and Guled, 2012) [4]. Short duration pigeonpea is integral part of the cropping systems of the farmers in all over the country because this crop fit well in the crop rotations and intercropping system.

Pigeonpea is generally grown in *kharif* season which faces more weed problems due to ample supply of moisture and temperature, resulted lower yield of crops. Mechanical weed control is an old age practice provides advantages like aeration and soil moisture conservation but with the increasing crisis of labour and exploring the possibility of herbicidal, weed control in pigeonpea deserves attention. Identification of a selective and cost effective herbicide can be a good alternative to provide weed free environment during early growth period in such an important crop. The available pre and post emergence *viz.* pendimethalin, oxyfluorfen, imazethapyr, sodium Acifluorfen + Clodinofof-propargyl, pendimethalin 30%+ imazethapyr 2% and imazamox 35% + imazethapyr 35% are able to check the emergence and growth of weeds at initial crop growth of pigeonpea. Keeping in the above view and fact, the present study was under taken to assess suitable pigeonpea based intercropping system and to find out appropriate herbicides for efficient weed control and higher growth and productivity of pigeonpea under Kymore Plateau of Madhya Pradesh.

Materials and Methods

The field experiment was carried out in the rainy (*Kharif*) season during the year 2016 and 2016 on sandy loam soil at Agriculture Farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.).

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Three intercropping system viz. sole pigeonpea, pigeonpea + greengram (2:2) and Pigeonpea + greengram (2:2) and seven treatments viz. W₁: Weedy check, W₂:Pendimethalin 30 EC@ 1 kg a.i./ha, W₃: Oxyfluorfen @ 0.2 kg a.i./ha, W₄: Imazethapyr @ 0.1 kg a.i./ha, W₅: Sodium Acifluorfen 16.50%EC+Clodinofof-propargyl 8%EC, W₆: Pendimethalin 30%+ imazethapyr 2% and W₇: Imazamox35%a.e.+ imazethapyr 35% were comprised in Split Plot design replicated as three. The variety Pigeonpea UPAS-120 was taken as test crop. The experimental soil was sandy loam in texture having pH 7.84, EC 0.82 dSm⁻¹, organic carbon (0.23%), Available N (194.51 kg/ha), P (9.14 kg/ha) and K (210.32 kg/ha). Pre emergence herbicides (Pendimethalin and oxyflourfen) were applied on the second day after sowing of the crop while post emergence herbicide (imazethapyr) was applied 25 days after sowing the crop with the help of knapsack sprayer fitted with flat fan nozzle using 500 liters of water per hectare. The important growth parameters, grain yield and straw yield were recorded at per standard procedure. Experimental data related to each character was statistically analysed as per procedure of analysis of variance and significance was tested by "F" test (Gomez and Gomez, 1984) [2].

Results and Discussion

Growth Parameters

The growth parameters viz. plant height, dry weight/plant and branches/plant on pigeonpea significantly affected due to intercropping systems as well as different weed management practices (Table 1). Plant height (149.84 cm) and plant dry weight (41.0 g) of pigeonpea were recorded significantly higher under sole pigeonpea which exhibited statistically at par with pigeonpea + greengram (2:2) intercropping system. However, primary branches (10.19) and secondary branches/plant (9.30) of pigeonpea were observed significantly more under sole pigeonpea which showed statistically on par with pigeonpea + blackgram (2:2) intercropping system. This might be ascribed due to least competition faces to pigeonpea with greengram crops which leads to better growth parameters under pigeonpea + greengram (2:2) intercropping system. The results are agreement with the findings of Dhoble (1990) [1].

Amongst weed control measures, plant height, plant dry weight, primary branches and secondary branches/plant of pigeonpea was noticed significantly higher under under W₆, pendimethalin 30% + imazethapyr 2% @ 1 kg/ha followed by W₇, Imazamox 35% + imazethapyr 35% @ 30g/ha and W₅, Sodium Acifluorfen 16.50% EC + Clodinofof-propargyl 8% EC @ 0.245 kg/ha. The improvement in these morphological parameters might be due to least crop weed competition that might have resulted in better interception and utilization of radiant energy leading towards higher photosynthesis. Similar findings were also reported by Sharma *et al.* (2010) [3].

Productivity

The productivity parameters were expressed in term of grain and stover yields. The seed and stover yield of pigeonpea was noted significantly higher under I₁, pigeonpea sole (10.83, 26.94 q/ha) which was statistical at par with I₂, pigeonpea+ greengram (2:2) intercropping system (10.15 q/ha, 25.33 q/ha). This could be ascribed due to better growth parameters of pigeonpea under green gram intercropping system. Such increase might be due to better spatial arrangement of pigeonpea under sole as well as pigeonpea+ greengram intercropping systems with 2:2 row ratio. Synergistic effects of intercropping on the yield of pigeonpea were also recorded by Dangi (2012) [5]. In weed control methods, seed yield of pigeonpea was obtained significantly superior under W₆, pendimethalin 30% + imazethapyr 2% @ 1 kg/ha (12.43 q/ha) and W₇, Imazamox 35% + imazethapyr 35% @ 30 g/ha (12.38 q/ha) while, stover yield was obtained significantly superior under Imazamox 35% + imazethapyr 35% @ 30 g/ha (32.03 q/ha) followed by W₆, pendimethalin 30%+ imazethapyr 2% @ 1 kg/ha (30.05 q/ha). Such trend in yield parameters under these weed treatments could be associated with least weed flora and weed density. This higher yields might be due to significantly better growth promoting soil environments and least competition between crop plants and weeds which resulted in better interception and utilization of radiant energy leading to higher photosynthesis and finally more formation of yield attributes and ultimately greater seed yield of pigeonpea. The results corroborate with the findings of Sharma and Galed (2012) [4].

Table 1: Effect of intercropping systems and weed management practices on growth parameters of pigeonpea (Pooled of 2 Years)

Treatments	Plant height at harvest (cm)	Plant dry weight (g/plant) at harvest	Primary branches	Secondary branches
Inter cropping system				
T ₁ , Sole pigeonpea	149.84	41.00	10.19	9.30
T ₂ , Pigeonpea + greengram (2:2)	148.66	40.65	9.37	8.85
T ₃ , Pigeonpea + blackgram (2:2)	144.85	37.97	10.19	9.08
SEm±	0.55	0.504	0.098	0.105
CD (P=0.05)	1.59	2.04	0.39	0.42
Weed Control Practices				
W ₁ , Weedy check	119.50	19.70	7.95	5.85
W ₂ , Pendimethalin 30 EC @ 1 kg/ha	138.00	42.82	9.94	9.35
W ₃ , Oxyfluorfen @ 0.2 kg/ha	134.45	41.93	9.43	8.90
W ₄ , Imazethapyr @ 0.1 kg/ha	131.90	39.68	9.82	9.29
W ₅ , Sodium Acifluorfen 16.50% EC + Clodinofof-propargyl 8% EC @ 0.245 kg/ha	153.10	46.36	10.45	10.32
W ₆ , Pendimethalin 30% + imazethapyr 2% @ 1 kg/ha	158.32	49.49	11.19	11.43
W ₇ , Imazamox 35% + imazethapyr 35% @ 30 g/ha	155.05	47.75	10.99	10.84
SEm±	0.658	0.514	0.210	0.130
CD (P=0.05)	2.63	2.06	0.609	0.377

Table 2: Effect of intercropping systems and weed management practices on yield of pigeonpea (Pooled data of 2 Years)

Treatments	Seed yield (q/ha)	Stover yield (q/ha)
Inter cropping system		
T ₁ , Sole pigeonpea	10.83	26.94
T ₂ , Pigeonpea + greengram (2:2)	10.15	25.33
T ₃ , Pigeonpea + blackgram (2:2)	9.69	24.83
SEM±	0.41	0.68
CD (P=0.05)	1.19	2.72
Weed Control Practices		
W ₁ , Weedy check	8.91	18.51
W ₂ , Pendimethalin 30 EC @ 1 kg/ha	10.41	26.95
W ₃ , Oxyfluorfen @ 0.2 kg/ha	9.50	26.43
W ₄ , Imazethapyr @ 0.1 kg/ha	9.30	25.36
W ₅ , Sodium Acifluorfen 16.50% EC + Clodinofof-propargyl 8% EC @ 0.245 kg/ha	10.90	29.28
W ₆ , Pendimethalin 30% + imazethapyr 2% @ 1 kg/ha	12.43	30.05
W ₇ , Imazamox 35% + imazethapyr 35% @ 30 g/ha	12.38	32.03
SEM±	0.39	0.59
CD (P=0.05)	1.13	1.71

Conclusion

The pigeonpea + greengram (Paired row 2:2) intercropping system with application of pendimethalin 30%+ imazethapyr 2% @ 1 kg/ha (W₆) and Imazamox 35% + imazethapyr 35% @ 30 g/ha (W₇) was found best treatment for higher growth and productivity of pigeonpea under Kymore Plateau of Madhya Pradesh.

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