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Growth, Yield Performance and Nutrient Content as Influenced by Intercropping and Weed Control Measures in Moth Bean

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Abstract A field experiment was conducted during *kharif* of 2014 to study the effect of different weed control measures and intercrops on growth and yield of moth bean. Experimental result revealed that sole moth bean significantly increase the grain and straw yield of moth bean as compared to moth bean intercropping with pearl millet. All the weed control treatments viz., hand weeding twice at 20 and 35 DAS, pendimethalin at 0.75 kg ha^{-1} as pre emergence and imazethapyr 40 g ha^{-1} as post emergence significantly increase plant height, dry matter accumulation per plant, pods per plant, seeds per pod, seeds per pod, grain and straw yield of moth bean. Nitrogen, phosphorus and potassium content in grain as well as in straw of moth bean were significantly increase with all weed control treatments as compared to weedy check.

Keywords Moth bean, Intercrop, Weed control, Nutrient content.

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Introduction

Moth bean [*Vigna aconitifolia* (Jacq.) Marchall] is important leguminuous crop of arid and semi arid regions, which fits well in intercropping system with pearl millet because of its shorter life span, besides other advantages. Moth bean contain about 20.5% easily digestible protein being relatively rich in lysine and tryptophan, the essential amino acids, in which cereals are deficient. It offeres a variety of edible products such as dried seeds, mature and immature green pods for vegetable and snacks. Moth bean has deep and extensive root system with profuse vegetative growth and dense foliage, thus acts as a protective cover against soil erosion, smothers weeds and conserves soil moisture for a longer period. The duration of crop is very short; hence it is most suitable for low rainfall areas of western Rajasthan [1]. Recent increase in its demand is quite explainable as it is the crop, which has made Bikaner as a major *papad* and *bhujia* producing hub in the world. All these reasons make moth bean an economic crop of the area.

Weed infestation is considered as one of the

most important constraint that limits yields in intercropping system. Weeds adversely affect crop production because they compete with the crop plants for nutrient, moisture, light and space. Thus, weed control has become crucial for quality product and higher yields. Conventional methods of weed control being weather dependent, laborious, time consuming and costly being less efficient in controlling weeds compare to use of herbicides, there is need to explore suitable herbicide (s), which may be effective and economically viable for both monoculture and intercropping. In recent years, pendimethalin has performed well in leguminous and cereals crops as pre-emergence herbicide. It is a selective and pre-emergence herbicide, absorbed by roots and leaves. Experimental evidence are available that the use of pendimethalin as pre-emergence spray can completely control early emerged broad leaf and annual grassy weeds [2]. If the farmers skipped to apply this herbicide due to one or other reasons, application of post -emergence herbicide is the option left with them. In view of paucity of information on weed management especially the application of post-emergence herbicides an attempt has been made to test imazethapyr as a post -emergence herbicides, as these have shown encouraging results in other leguminous crops. Numerous reports on weed control in sole pearl millet are available [3] but information on control of weeds in pearl millet and legume intercropping system in arid zone is lacking, particularly on herbicidal weed control. So there is a need to test chemical as well as other methods of weed control for pearl millet and legume intercropping system. The present study was undertaken to identify the suitability of imtercrop and weed control method for maximum productivity of moth bean.

Materials and Methods

A field experiment entitled was carried out during *kharif* of 2014 at the Instructional Farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan (28.01 ^{o}N latitude and 73.22^{o}E longitude at an altitude of 234.70 m amsl and receiving average annual rainfall of 265mm. The experimental soil was loamy sand with slightly alka-

Table 1. Growth and yield of moth bean as influence by intercrop and weed control . DAS : Days after sowing.

Treatments	Plant stand (000 ha^{-1})		Plant height (cm)		Dry matter accumulation (g plant^{-1})		Yield Harvest				
	30 DAS	At harvest	30 DAS	At harvest	Pods 30 DAS	Seeds At harvest	per plant	per pod	(kg/ha^{-1}) grain	straw	index (%)
Intercropping											
Pearl millet sole	–	–	–	–	–	–	–	–	–	–	–
Cluster bean sole	–	–	–	–	–	–	–	–	–	–	–
Moth bean sole	287	276	14.32	24.41	4.40	16.38	32.50	5.33	794	1949	28.8
PM + CB (1 : 2)	–	–	–	–	–	–	–	–	–	–	–
PM + MB (1 : 2)	192	182	13.98	23.30	4.27	15.62	34.50	5.62	540	1194	30.9
SEm ±	6.5	7.1	0.30	0.93	0.17	0.58	0.80	0.29	28.7	78.8	0.9
CD (*P*=0.05)	39	43	NS	Ns	NS	NS	NS	NS	174	479	NS
Weed control											
Weedy check	238	215	12.98	20.33	3.06	12.25	31.00	4.70	467	1259	27.6
Two hand weeding at 20 and 35 DAS	241	237	15.17	26.05	5.31	19.30	35.00	6.17	816	1919	30.3
Pendimethalin 0.75 kg ha^{-1} as PE	240	233	14.32	24.72	4.64	16.73	34.33	5.55	697	1574	30.9
Imazethapyr 40 g ha^{-1} at 25 DAS as PoE	239	232	14.13	24.32	4.34	15.70	33.67	5.48	687	1534	30.7
SEm ±	5.2	5.5	0.42	1.22	0.20	0.81	0.70	0.23	37.6	83.6	0.8
CD (*P*=0.05)	NS	17	1.28	3.75	0.61	2.49	2.13	0.71	116	257	2.6

line in reaction. The status of soil was poor in organic carbon (0.08%) and low in available nitrogen (86.40 kg ha^{-1}), medium in phosphorus (21.91 kg ha^{-1}) and high in available potassium (234.00 kg ha^{-1}).

The experiment was laid out in split plot design comprising 20 treatments combination, replicated three times. Five cropping systems as main plot treatments comprised sole pearl millet, sole cluster bean, sole moth bean, pearl millet + cluster bean millet + moth bean. Sowing of sole crop of pearl millet, moth bean and cluster bean was done with pure stand.Pearl millet intercrop with moth bean and pearl millet intercrop with cluster bean were sown with 1 : 2 row ratio. Four weed control treatments in sub plot comprised weedy check (remained infested till harvest), hand weeding twice at 20 and 45 DAS, pendimethalin at 0.75 kg ha^{-1} as pre emergence and imazethapyr 40 g ha^{-1} as post emergence. The sowing of the crop was done by "*kera*" method in open furrow on July 23, 2014.

Results and Discussion

Plant stand in sole moth bean was significantly higher as compared to pearl millet -moth bean intercropping system. Significant difference among systems of intercropping in plant stand was by the virtue of the row ratio of intercropping system [1]. Plant height, dry matter accumulation per plant at 30 DAS and at harvest, pods per plant, seeds per pod of moth bean was not influenced significantly due to pearl millet-moth bean intercropping system.

All the weed control measures significantly increase plant stand, per plant dry matter accumulation, pods per plant, seeds per pod, grain yield, straw yield and harvest index compared to weedy check. Moreover, hand weeding twice produced significantly higher grain yield and straw yield of moth bean as compared to both herbicidal weed control measures. Hand weeding twice, Pendimethalin at 0.75 kg ha^{-1} and Imazethapyr at 40 g ha^{-1} were found most effective in enhancing crop growth in terms of periodic plant stand, plant height and dry matter accumulation, nodules per plant, pods per plant, seeds per pod and yield of moth bean. The variation in grain and straw yield due to different weed control measures associated with the variation in weed control. Hand weeding treatment recorded the highest grain and straw yield which seems to be due to minimum dry matter production of weeds in these plots. Moreover, manual hand weeding also helps in improving soil physical condition which ultimately creates congenial condition for crop growth, besides providing

Table 2. Effect of intercrop and weed control on nutrient content of moth bean. DAS : Days after sowing.

Treatments	Nitrogen content (%)		Phosphorus content (%)		Potassium content (%)	
	Grain	Straw	Grain	Straw	Grain	Straw
Intercroping						
Pearl millet sole	–	–	–	–	–	–
Cluster bean sole	–	–	–	–	–	–
Moth bean sole	3.606	0.822	0.426	0.239	0.3375	0.732
PM + CB (1 : 2)	–	–	–	–	–	–
PM + MB (1 : 2)	3.590	0.796	0.412	0.227	0.364	0.725
SEm ±	0.041	0.009	0.004	0.002	0.004	0.008
CD (p=0.05)	NS	NS	NS	NS	NS	NS
Weed control						
Weedy check	3.461	0.778	0.383	0.216	0.355	0.710
Two hand weeding at 20 and 35 DAS	3.663	0.823	0.433	0.247	0.377	0.753
Pendimethalin 0.75 kg ha^{-1} as PE	3.640	0.820	0.425	0.236	0.375	0.728
Imazethapyr 40 g ha^{-1} at 25 DAS as PoE	3.628	0.813	0.434	0.233	0.372	0.724
SEm ±	0.050	0.011	0.006	0.003	0.005	0.010
CD (p=0.05)	0.153	0.034	0.018	0.010	0.016	0.031

effective weed control. The favourable effect of weed control on account of reduced weed crop competition under this treatment led to significant increase in various yield parameters viz. numbers of plant height, nodules per plant and pods per plant. Further, contribution of weed control measures on reducing crop weed competition and increasing the weed control efficiency and hence, better utilization of inputs by crop plants [4]. Herbicidal weed control treatments, pendimethalin at 0.75 kg ha^{-1} and imazethapyr at 40 g ha^{-1} controlled the different type of weeds (monocot and dicot) effectively. These treatments significantly increased the grain and straw yield of cluster bean and moth bean by reducing density and dry matter production of weeds, generate favorable environment for better growth of crop plant. Results corroborate with the findings of several researchers [5, 6].

Nitrogen, phosphorus and potassium content in grain and straw of moth bean was not influenced by intercropping system with pearl millet as well as sole crop. All the weed control treatments recorded significant increase in nitrogen, phosphorus and potassium content in grain and straw of moth bean over weedy check. Hand weeding twice, pendimethalin at 0.75 kg ha^{-1} and imazethapyr at 40 g ha^{-1} effectively controlled and suppressed the weed growth and thereby provided weed free environment to the crop to utilize the available nutrients under lesser crop weed competition for nutrients, resulting in increased nitrogen, phosphorus and potassium [3].

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