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Evaluation of High Yielding Varieties and Demonstration of Production Technologies in Moth bean at Farmers' Fields in Western Rajasthan

N.K. Sharma*, N. Kumawat and P.K. Panwar

Swami Keshwanand Rajasthan Agricultural University, Bikaner 334 006, India

Abstract: Seventeen varietal trials accommodating seven varieties and ninety technology demonstrations of moth bean were conducted at farmer's fields under rainfed and irrigated situations during kharif-2015 in five districts namely Jaisalmer, Bikaner, Churu, Jhunjhunu and Hanumangarh of western Rajasthan. The average seed yield of moth bean varieties under rainfed situation ranged between 417 to 517 kg ha^{-1}. However, under irrigated situation, it varied between 754 to 841 kg ha^{-1}. The maximum seed yield of 601 kg ha^{-1} was provided by variety RMO-435 followed by RMB-25 and RMO-257 with 581 and 556 kg ha^{-1}, respectively. Under technology demonstrations, seed yield of moth bean under rainfed situation ranged between 225 to 750 kg ha^{-1} with the average of 434 kg ha^{-1}. However, under irrigated situation, it varied between 582 to 1040 kg ha^{-1} with the average of 878 kg ha^{-1}. The overall productivity of the moth bean demonstrations was found 70.2% higher over state average productivity.

Key words: Farmer's field, moth bean, seed yield, technology demonstration, varietal trial.

Moth bean [*Vigna aconitifolia* (Jacq.) Marechal] is a short duration, deep rooted legume recognized for its twin benefits of tolerance for drought and heat. It has ability to grow under harsh climate, low rainfall and poor soil conditions and considered as most significant pulse crop of arid Rajasthan (Sharma and Ratnoo, 2014). Moth bean is a potential reservoir of proteins, essential minerals and vitamins and providing nutritional security to vegetarians of arid region (Kumar, 2002). It is used as human food in the form of *Dal*, sprouts as salad, green pods as vegetable, and also to prepare *Bikaneri Bhujiya* and *Papad* which are widely popularized in national and international market. It is also a source of fodder for domestic animals particularly for horses at pod formation stage. Moth bean is a cover crop and shields soil from solar heat, retain soil moisture and prevent losses of organic matter and retards soil erosion as well. Its leguminous nature fixes atmospheric nitrogen and enhances soil fertility.

In Rajasthan, moth bean is being grown in 1336731 ha, which is about 50% of total area under kharif pulses. Bikaner, Churu, Barmer, Nagaur and Jodhpur are among the major moth bean growing districts of the state. The production and productivity of moth bean is highly erratic and varies with the amount and distribution of rainfall. The average productivity of moth bean in Rajasthan (2007-08 to 2011-12) ranged between 176 kg in district Pali and 481 kg ha^{-1} in district Jalore with the state average of 296 kg ha^{-1} (Anonymous, 2012-13), which is much lower than the potential productivity of improved cultivars.

Presently, the cultivation of moth bean in arid Rajasthan is almost default organic. A large number of research experiments have shown that crop productivity may be enhanced considerably through improved varieties and crop management practices but their adoption at farmer's fields is poor because of weak research-extension linkage. Farmer participatory action research is a sound research oriented extension program, where farmers have an option to choose best variety and crop management technology for their own field situation (Sharma, 2014). Hence, present studies were conducted with the objectives to evaluate high yielding varieties and to demonstrate the production technologies of moth bean at farmer's fields in western Rajasthan.

Materials and Methods

Seventeen varietal trials and ninety technology demonstrations were conducted under rainfed and irrigated situations at farmer's fields during kharif-2015 in five districts of western Rajasthan (Table 1).

In varietal trial, seven varieties (Table 2) were uniformly evaluated in strips at each

*E-mail: nksharmaars@yahoo.co.in

Table 1. Varietal trials and technology demonstrations of moth bean conducted at farmer's fields in kharif 2015

Districts	No. of varietal trials			No. of technology demonstrations		
	Rainfed	Irrigated	Total	Rainfed	Irrigated	Total
Bikaner	2	0	2	30	0	30
Churu	1	3	4	22	7	29
Jaisalmer	3	0	3	5	3	8
Jhunjhunu	3	1	4	11	0	11
Hanumangarh	4	0	4	9	3	12
Total	13	4	17	77	13	90

location. In technology demonstration, variety RMO-435/RMB-25 were with seed rate @ 15 kg ha^{-1} along with fertilizers dose of 10 kg nitrogen and 20 kg phosphorus ha^{-1} applied as basal followed by foliar spray of 1% NPK soluble (18:18:18) at 40-45 days after sowing. Seed was treated with carbandazim @ 2.5 g kg^{-1} before sowing and foliar spray of imidacloprid 17.8 SL @ 150 ml ha^{-1} applied at 35-40 days after sowing for disease and pest management. Each varietal trial and technology demonstration was laid out in 0.40 ha area. Most of the varietal trials and technology demonstrations were sown during 1st week of July and harvested during 1st week of September. Farmer-scientists interaction and field day program were also organized to create awareness among farmers regarding improved moth bean cultivation practices.

Results and Discussion

Performance of varieties

Out of seventeen varietal trials conducted under rainfed and irrigated situations in different parts of western Rajasthan, 15 trials remained successful. The seed yield of different varieties under rainfed situation ranged between 417 to 517 kg ha^{-1}; however under irrigated situation it varied between 754 to 841 kg ha^{-1} (Table 2). Among cultivars, the maximum seed yield of 601 kg ha^{-1} was provided by variety RMO-435 followed by RMB-25 and RMO-257 with 581 and 556 kg ha^{-1}, respectively. These three varieties have performed better than the average therefore; these high yielding varieties may be promoted for cultivation to enhance the moth bean productivity in western Rajasthan. Sharma and Ratnoo (2014) also reported similar results in moth bean. Genetic variability for seed yield and morphological traits in moth bean has been reported by Kumar (2002), Sinhag *et al.* (2004) and Yaqoob *et al.* (2007).

Performance of technology demonstrations

Out of 90 demonstrations conducted under rainfed and irrigated situations at farmer's fields, 83 demonstrations remained successful. Under rainfed situation, average seed yield of 70 moth bean demonstrations ranged between 225 to 750 kg ha^{-1} with the overall productivity of 434 kg

Table 2. Seed yield of moth bean varieties under rainfed and irrigated situations at farmer's fields

Varieties	Seed yield (kg ha^{-1})				
	Rainfed situation (No. of demonstrations-6)		Irrigated situation (No. of demonstrations-9)		Overall performance (No. of demonstrations-15)
	Average	Range	Average	Range	Average
CAZRI Moth-2	428	325-639	839	691-985	538
RMB-25	486	351-727	841	787-975	581
RMO-40	431	326-619	769	711-910	521
RMO-225	417	301-572	754	655-870	507
RMO-257	481	328-715	761	625-823	556
RMO-423	469	350-723	764	630-845	547
RMO-435	517	399-779	834	735-940	601
Range	417-517	-	754-841	-	507-601
Mean	461	-	794	-	550

Table 3. Seed yield of mothbean demonstrations at farmer's fields

Agro-ecological situation	Total number of demonstrations	No. of successful demonstrations	Average seed yield (kg ha^{-1})	State average productivity (kg ha^{-1})	% increase over state average
Rainfed	77	70	434 (225-750)	-	46.6%
Irrigated	13	13	878 (582-1040)	-	196.6%
Overall	90	83	504	296	70.2%

Note: Values given in the parenthesis is the range of productivity observed at farmer's fields

ha^{-1}. However, under irrigated situation, seed yield of 13 demonstrations ranged between 582 to 1040 kg with the average of 878 kg ha^{-1} (Table 3). The wide range of variation observed in the productivity was mainly attributed by the erratic rainfall pattern and soil factors of the demonstration site.

The overall productivity of the moth bean demonstrations was found 504 kg ha^{-1}, which was 70.2% higher over average productivity of the Rajasthan. The yield enhancement observed under technology demonstration was mainly attributed due to the application of improved variety with recommended seed rate, basal and foliar application of fertilizers, and plant protection measures. Similar results were also reported by Meena *et al*. (2012) and Verma and Dayanand (2013) in moth bean.

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