

Screening of Common Bean Genotypes at Farmers Field in Kashmir - Baby Trial Evaluation System

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ABSTRACT

Present investigation was undertaken during 2014 to generate information, through evaluation of the set of material at the farmers' field along with the farmers' variety as a check through participatory varietal selection using baby trials. Trials were laid at various locations of north kashmir summing to a total of twenty trials at different villages, In which 6 genotypes that were selected from mother trials and were tested further by paired comparison through baby trial evaluation system. The genotypes were laid with the farmers' variety to make an easy comparison of the important yield and yield attributing traits. The comparison of the test varieties was made on the basis of same, more, less and compared to farmers' variety regarding various traits. Out of the six genotypes (WB-185, WB-83, WB-195, WB-966, WB-258, and Shalimar Rajmash-1) selected from the mother trial only three (WB-185, WB-83, WB-195) seemed to be better than the local check than other three varieties (WB-966, WB-258, and Shalimar Rajmash-1) in the baby trial. The finally selected three varieties from the baby trial were having the desirable traits as, days to 50% flowering and days taken for maturity less than the average, the mean of number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot were higher than the average mean of the local farmers' check and the other three mother selected genotypes. The study revealed that, it is therefore recommended that the genotypes WB-185, WB-83 and WB-195 should be extensively tested in farmers fields for further evaluation as well as concomitant seed multiplication, so that the variety goes into production chain. It would be desirable to encourage participant farmers to take up seed production, so that local systems are strengthened.

Key word: Common Bean, Farmers Preference Scoring, Farmers Preference Ranking, Mother Trial, Baby Trial.

INTRODUCTION

The recent emergence of the participatory plant breeding movement represents a response to weaknesses of the traditional global approach to plant breeding. Participatory Plant Breeding has evolved as viable alternative to the conventional plant

breeding that lays more emphasis on the involvement of different stakeholder's right from deciding the varietal specifications, selection of parents through to the selection across segregating generations as well of testing and release of the product.

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The greater involvement of farmers' and other stakeholders ensures that their perceptions are taken care of in order to speed up the rate of adoption. The level of participation may vary depending upon the stage of participatory plant breeding programme but participation has to be effective at all the stages.

Rationale of the study

Agriculture in general and *Rajmash* in particular in small holder farming system like in Kashmir suffer from certain inherent bottlenecks such as marginality, fragility, inaccessibility, heterogeneity while enjoying a comparative advantage in niche based cropping system. Therefore any technological intervention including the varietal developmental process has to be fine-tuned in order to enable farmers to harness advantages and overcome the constraints. Plant breeders as outsiders have often failed to appreciate certain important farm and nonfarm characteristics that have a significant bearing on varietal suitability and adoption. It is with this imperative that SKUAST Kashmir initiated participatory varietal selection programmes to add relevance to the process. As a socially responsible process it seeks to empower farmers in decision making and varietal evaluation as well as strengthen the local seed system. The current study is a part of broader research effort in order to identify farmers' production constraints and varietal attributes that will help disseminate appropriate varieties suitable to the farming systems.

MATERIALS AND METHODS

The present study was undertaken during 2012-2014 in the north Kashmir which is potential area for *rajmash* cultivation. The experimental set up is presented below under appropriate headings:

Selection of study area

The selection of sites was done in consultation with KVK's of respective districts and line (agriculture) departments. All the villages were selected on the basis of their strategic

importance.

Statistical analysis of Baby trial data

The analysis of baby trials was simply carried out, by means of changing the data into percentages individually of the parameter same, more and less and calculating the general mean of the percentages individually. The standard deviation was also calculated from the data for data interpretation.

Layout of baby trials

The trial nomenclature – mother and baby – followed that of Snapp³. The baby trials were single-replicate, single-test-entry trials with farmers' as replicates. Farmers' grew the test entry alongside a check variety in paired plots in the same field, both under the farmer's usual management conditions. There were fewer mother trials because they required more resource for supervision. The methods for participatory evaluation followed those described in Joshi and Witcombe².

The selected genotypes from the mother trial, were evaluated through baby trials. Only six (6) genotypes were selected for baby trial evaluation. The baby trials were laid both in the area/villages where the mother trials were laid and other villages also. In total there were twenty baby trials across the north Kashmir. The baby trials were not laid at the research stations but exclusively at the farmers' field. In baby trial the area under a particular variety is more as compared to that of the mother trial. Generally one variety is evaluated in baby trial against the farmers' check. We can have two or more varieties to be checked in the baby trial system against the farmers' check. The variety given to a farmer is considered as a treatment with the farmers' as different replicates.

The evaluation of the genotypes in case of baby trials is simply carried out on the basis of same, more or less against the established farmers' check. The comparison of the varieties with the local check and between the varieties was carried out on the basis of farm walk and focussed group discussions (FGD).

EXPERIMENTAL FINDINGS

The present investigation was carried out for evaluation of released varieties, pre-released materials, advanced breeding lines, landraces or germplasm accessions on farmers' fields under his management practices. The genotypes selected from the mother trial were evaluated through baby trials as only six genotypes namely WB-185, WB-83, WB-966, WB-258, WB-195 and Shalimar Rajmash-1 were selected for baby trial evaluation in the next year based on preferential index values of mother trials. The area under baby trial was more than that of the mother trial. However in case of private sector, strip of crop variety is laid which proves more economical than the research baby trial and gives same result.

Comparison of the bean genotypes at farmers' field

The farmers' perceptions about the six *rajmash* varieties were assessed through the focused group discussions. The six varieties (WB-185, WB-83, WB-195, WB-966, WB-258, and Shalimar Rajmash-1) were compared with the farmers' local check for various yield and yield attributing traits viz., days to flowering, days to maturity, number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot. These varieties vary considerably in different traits with each other and with the local check.

Variety WB-185 when compared with the local check shows days to 50% flowering is almost same as compared to check as 90% of farmers vote in this favour. 94.3% of farmers' vote that, days to maturity is same as compared to check while only 5.6% vote that it needs more days for maturity. However the farmers' reflect that the variety is having more number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 93.5, 94.2, 95.7 and 95.9% of farmers respond in favour respectively. So from the data and table it reflects that the variety is more desirable than the check in all the yield attributing traits (Table 2). The variety is red in colour with kidney shape and bush type of plant structure makes it more desirable and fit to the farming community.

Variety Shalimar Rajmash-1 when compared with the local check shows days to

50% flowering is almost same as compared to check as 83.7% of farmers vote in this favour and only 16.82% vote as the variety having more days to 50% flowering than the check. 90.5% of farmers' vote that, days to maturity is more as compared to check while only 9.5% vote that it needs same days for maturity when compared with the check. However, the farmers' preferences and voting reflect that the variety is having almost same number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 94.4, 90.45, 88.09 and 90.9% respectively. So from the data and table it reflects that the variety is almost same as compared to the local check and is not desirable in all the yield attributing traits (Table 2). The variety is not favoured also because of more damage due to susceptibility to bean common mosaic virus. The variety is having selective advantage over the farmers check as the variety is red in colour with kidney shape (preferred traits) assuming bush type of plant architecture.

Variety WB-966 when compared with the local check shows that the traits vary considerably among themselves between more, same and less. 52.28% of farmers' reflect that days to 50% flowering is almost less as compared to check and 44.25 and 20.1% of farmers vote that it is having more and same days to 50% flowering as compared to check respectively. 87.1% of farmers' vote that, days to maturity is more as compared to check while only 15.1 and 15% vote that it needs same and less number of days for maturity than check. However the farmers' reflect that the variety is having almost same number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 93.5, 83.27, 91.35 and 86.53% respectively. So from the data and table it reflects that the variety is not desirable than the check as such in all the yield attributing traits, but can be grown as few yield attributing traits are more tilted towards the variety compared to the check (Table 2). The variety is also having selective advantage over the farmers check as the variety is red in colour with kidney shape (preferred traits) assuming bush type of plant architecture.

Table-3 reflects that Variety WB-83 when compared with the local check shows days to 50% flowering is less as compared to check as 93.2% of farmers vote in this favour. 96.1% of farmers' vote that, days to maturity is less as compared to check while only 8.6% vote that it needs same days for maturity. However the farmers' reflect that the variety is having more number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 94.4, 92.5, 96.2 and 96.0% of farmers respond in this favour respectively. So from the data and table it reflects that the variety is more desirable than the check in all the yield attributing traits (Table -3). So from the Table it reflects that, when we compare it with WB-185 and others, the variety is more desirable among all the traits than other varieties and the farmers' check. It is pole type of *rajmash* with purple colour of seeds and Cuboidal in shape collected locally from the valley. It is mostly grown with maize and is highly adapted with it to give higher yields.

Variety WB-258 when compared with the local check shows that the vote in favour of different traits varies considerably among themselves between more, same and less.

79.82% of farmers' reflect that days to 50% flowering is almost same as compared to check and 18.98 and 19.58% of farmers vote that it is having more and less days to 50% flowering as compared to check respectively. 94.02% of farmers' vote that, days to maturity is same as compared to check while only 16.5 and 15.2% vote that it needs more and less number of days for maturity than check. However the farmers' in general reflect that the variety is having almost same number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 86.65, 87.35, 93.76 and 94.02% of farmers response were in its favour regarding the traits respectively. So from the data and table it reflects that the percentage response of farmers' regarding the variety vary considerably among different traits, hence the variety is not as such desirable than the check in all the yield attributing traits, but can be grown as few yield attributing traits are more tilted towards the variety compared to the check (Table-3). It is pole type collected locally from the Kishtwar area of the Jammu having red colour with Cuboidal shape being the traits preferred by the farmers.

Table-1: List of genotypes selected from the Mother trials with certain characteristics

Trait/genotype	WB-185	WB-83	WB-195	WB-966	WB-258	SR-1
Colour	Red	Purple	Chocolate	Red	Red	Red
Shape	Kidney	Cuboidal	Kidney	Kidney	Cuboidal	Kidney
Source	CIAT (Columbia)	Local	Local	Ciat (Columbia)	Kishtwar	SKUAST- K (canadian red × local red)
Plant type	Bush	Pole	Bush	Bush	Pole	Bush

Table-2: Statistical analysis of farmers' perception (%) of common bean varieties in comparison to local land race through baby trial evaluation system

Trait	WB-185 vs. Farmers Check			SR-1 vs. Farmers Check			WB-966 vs. Farmers Check		
	Farmers preferences			Farmers preferences			Farmers preferences		
	More	Same	Less	More	Same	Less	More	Same	Less
Days to flowering	9.22±0.5	90±2.18	0±0	16.82±0.7	83.17±1.1	0±0	44.25±1.4	20.1±0.6	52.28±1.9
Days to maturity	5.6±0.4	94.3±0.8	0±0	90.5±1.1	9.5±0.5	0±0	87.1±1.04	15.1±0.4	15±0.4
No of pods/plant	93.5±0.7	6.47±0.5	0±0	5.59±0.4	94.4±0.7	0±0	6.4±0.5	93.52±0.7	0±0
Pod yield/plant	94.2±0.8	5.76±0.48	0±0	9.54±0.5	90.45±1.08	0±0	16.7±0.4	83.27±0.9	0±0
Seeds/pod	95.7±0.93	4.213±0.44	0±0	8.02±0.4	88.09±0.7	14.86±0.	8.6±0.5	91.35±0.7	0±0

Table-3: Statistical analysis of farmers' perception (%) of common bean varieties in comparison to local land race through baby trial evaluation system

Trait	WB-83 vs. Farmers Check			Wb-258 vs. Farmers Check			WB-195 vs. Farmers Check		
	Farmers preferences			Farmers preferences			Farmers preferences		
	More	Same	Less	More	Same	Less	More	Same	Less
Days to flowering	-	8.99±0.4	93.2±1.02	18.98±0.5	79.82±1.1	19.58±0.5	15.41±0.5	88.44±1.3	0±0
Days to maturity	-	8.6±0.4	96.1±0.8	16.5±0.3	94.02±0.9	15.2±0.2	6.4±0.5	94.02±0.9	0±0
No of pods/plant	94.4±0.7	5.59±0.4	0±0	14.58±0.3	86.657±0.8	18.95±0.5	91.48±1.09	8.59±0.5	0±0
Pod yield/plant	92.57±0.7	7.429±0.5	0±0	17.90±0.5	87.35±0.8	18.65±0.3	98.45±0.9	10.31±0.3	0±0
Seeds/pod	96.20±1.05	5.063±0.4	0±0	14.75±0.4	93.76±0.8	16.98±0.3	95.90±0.8	11.68±0.4	0±0

Table-3 reflects that Variety WB-195 when compared with the local check shows days to 50% flowering is same as compared to check as 88.4% of farmers vote in this favour against 15.41% which respond that variety is having more days to 50% flowering than check. 94.02% of farmers' vote that, days to maturity is same as compared to check while only 6.4% vote that it needs more days for maturity than check. However the farmers' reflect that the variety is having more number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot than the check viz., 91.48, 98.45, 95.90 and 96.02% respectively. So from the data and table it reflects that the variety is more desirable than the check in all the yield attributing traits (Table-3). It is bush type of *rajmash* collected locally having chocolate colour with kidney shape being the traits preferred by the farmers.

DISCUSSION

Under the university's renewed focus on adding relevance to varietal developmental process, *rajmash* was identified as one of the target crops in view of its niche status as well as continuing dismal performance of pulses due to a host of socio-economic, biological farming system as well as production constraints. The present study aimed at identification of farmer and non-farmer attributes of *rajmash* based farming system as well as farmers' varietal preferences that meet their aspirations. Six (06) genotypes of both bush and pole type *rajmash* including farmer's variety (as check) were evaluated through

baby trial evaluation system in Kashmir to identify the most appropriate genotypes on the basis of preferences of the farmers' and to find the varietal specification to be bred in future in consultation with farmers'. Out of these six genotypes 03 were selected by the farmers' for future seed multiplication.

The mother and baby trial system recognizes the difficulty of obtaining reliable yield data from many, widely dispersed participatory trials, so in baby trials only farmers' perceptions on yield is collected. A farmer grows one new variety along side the local variety under the customary management practices. Replication is across farmers', either in the same village or across villages. Even if there are many new varieties, only one is tested by any one farmer. The trials are evaluated by participatory methods, farm walks and Focused Group Discussions. Qualitative data (for example, on yield) are obtained by project fellows from interviews with farmers'. PVS is now widely used and accepted. For example, Atlin¹ states that all breeding programmes should include participatory on-farm trials. Weltzien *et al*⁴., report that most cases of PPB they reviewed were only employing PVS. However, there are many ways of carrying out highly participatory trials. Private-sector breeders use strip trials in which each entry occupies a single strip of land across the farmer's field. The public sector employs some form of a mother and baby trials system³. However, they may not have always been referred to in that way. For example, the trials system used by Joshi and

Witcombe² consisted entirely of baby trials and it was called farmer-managed participatory research (FAMPAR).

There were twenty (20) baby trials laid during the year 2014, across the Kashmir. The farmers' perceptions about the six *rajmash* varieties selected from the mother trial, were assessed in the baby trials through farm walk and focused group discussions. The six varieties (WB-185, WB-83, WB-195, WB-966, WB-258, and Shalimar Rajmash-1) were compared with the farmers' local check for various yield and yield attributing traits viz., days to flowering, days to maturity, number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot. These varieties vary considerably in different traits with each other and with the local check. So the above discussion results that out of the six genotypes (WB-185, WB-83, WB-195, WB-966, WB-258, and Shalimar *Rajmash*-1) selected from the mother trial only three (WB-185, WB-83, WB-195) seems to be better than the local check and other three varieties (WB-966, WB-258, and Shalimar *Rajmash*-1). The finally selected three varieties from the baby trial are having the desirable traits as, days to 50% flowering and days taken for maturity less than the average, the mean of number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot being higher than the average mean of the local farmers' check and the other three mother selected genotypes.

The present study revealed that, it is therefore recommended that the genotypes WB-185, WB-83 and WB-195 should be extensively tested in farmers fields for further evaluation as well as concomitant seed multiplication, so that the variety goes into production chain. It would be desirable to encourage participant farmers to take up seed production, so that local systems are strengthened.

SUMMARY AND CONCLUSION

The present investigation was a part of initiative taken by SKUAST Kashmir in order to bring farmer and farming system characteristics into the mainstream varietal development process to add relevance to the varieties so that the adoption is more speedy

and the varieties can meet the aspirations of target farmers'. Under this programme, three crops namely rice maize and *rajmash* were identified for starting participatory varietal selection.

Baby trial

The farmers' perceptions about the six *rajmash* varieties which were selected from the mother trial were assessed through the focused group discussions. The six varieties (WB-185, WB-83, WB-195, WB-966, WB-258, and Shalimar *Rajmash*-1) were compared with the farmers' local check for various yield and yield attributing traits. These varieties vary considerably in different traits with each other and with the local check. On the basis of the comparison of the important yield attributing traits WB-83 was having less days to 50% flowering, days to maturity and was having highest percentage of farmers' favouring the variety on the basis of maximum number of pods per plant, pod yield per plant, seeds per pod and seed yield per plot. The 83 was followed by the varieties 195 and 185 which also got maximum favour from farmers' when compared with other genotypes and the farmers' check.

Roadmap for future

While institutional efforts on part of SKUAST-Kashmir and development departments have led to considerable diffusion of modern high yielding varieties in case of rice, maize and wheat, the situation is not so encouraging in pulses in general and *rajmash* in particular, with little or no impact of released varieties. The disproportionate impact of modern varieties is largely due to the inherent bottlenecks of low input small holder farming system of which *rajmash* is an important component in Kashmir valley. The attributes of such farming systems are both farm and non-farm and most of the times plant breeders have failed to appreciate the non-farm attributes, such as the socio-economic status, market opportunities and consumer preferences. This disconnection between the existing research priorities and the real world problems need to be bridged in order to overcome the risks associated with such disconnect. Even if the experience of PPB in

rajmash has been worth the effort, there is a need to strengthen the linking mechanisms to build a knowledge based for addressing current production constraints, harness the niches status of the crops as well as enhance the adaptive capacity of small *rajmash* farmers to future challenges. There are strong ecological, economical and social imperatives of such linkage. However major goal should be to enhance the farmers to be able to harness the livelihood opportunities, promote conservation through use and link gene banks to farmers needs as well as make them future ready. There is a growing demand for local niche crop based food that can provide new opportunities to small farmers'. There is a need to optimize different channels from production to consumption. Plant breeders have a strong role to develop varieties that are able to enable the farmers to harness the benefits.

Therefore while, as plant breeders as we re-orient our breeding programmes we should understand the farmer a socioeconomic status, his production constraints, his excess to resources as well as opportunities he has. There is a need to put farmer first in our breeding goals and then think beyond our obsession with yield. We need to identify the constraints and preferences of farmers and accordingly prioritize our researchable issues.

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