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Participatory Varietal Selection in (*Brassica rapa* var. Brown Sarson) under Temperate Conditions

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ABSTRACT

The study was undertaken during rabi 2013-14 under the restructured research strategy, wherein focus in varietal selection had to be laid on farmers perceptions and constraints under participatory mode. Participatory rural appraisal was done in the sixteen locations using a structured questionnaire based on socio-economic attributes, farming systems, production constraints and varietal preferences. The results indicated that there was significant difference among various traits. Mother trials comprising of 10 genotypes were laid at four locations namely Lethpora and Malangpora (Pulwama), Wanpoh (Anantnag) and Roohpura (Kulgam). The data revealed that genotypes were divergent. Participatory varietal selection was done at farmer's field through farm walk when the pods were at maturity stage. During farm walk voting for each genotype was done and preferential score was calculated for each genotype. Genotypes which were selected by farmers almost at every location were KBS-49, KBS-33, KBS-38.

Key words: *Brown sarson, Genotype, Participatory rural appraisal, Trait*

INTRODUCTION

Brassicas have been very important as food crops in the form of vegetables, feed and fodder, green manure and oilseeds. *Brassica rapa* (A genome, n=10) belongs to the *Cruciferae* (Brassicaceae) family. It is native to Europe, Russia, Central Asia and the Near East with Europe proposed as one of the centres of origin. The Asian type comprises of three ecotypes: brown sarson, yellow sarson and toria. The ecotypes yellow sarson and toria are derived from brown sarson, the former being the mutant for quality and later being the result of selection[6]. Brown sarson include both lotni (self-incompatible) and tora (self-compatible) types. The former is predominantly cultivated in colder regions of country particularly in Kashmir and Himachal hills while as latter is cultivated in eastern Uttar Pradesh.

India holds a premier position in rapeseed-mustard economy of the world with 2nd and 3rd rank in area and production respectively. It is the third largest rapeseed-mustard producer in the world after China and Canada with 12 per cent of world's total production[4].

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It is grown on an area of 5.8 m ha with a production of 6.8 MT and an average productivity of 1.17 t ha^{-1} [;2]. This crop accounts for nearly one third of the oil produced in India, making it the country's key edible oilseed crop after groundnut and soybean. This group of oilseed crops is gaining wide acceptance because of adaptability for both rainfed as well as irrigated areas and suitability for sole as well as mixed cropping. Despite its wide adaptability for varied agro-climatic conditions, the area, production and yield of rapeseed-mustard in India have been fluctuating due to various biotic and abiotic stresses coupled with India's domestic price support programmes. Participatory Plant Breeding (PPB) has evolved as a viable alternative to conventional plant breeding that lays more emphasis on the involvement of different stake holders right from deciding the varietal specification, identification of parents through the selection across segregating generations as well as testing and release of the product[1] . The greater involvement of farmers and other stakeholders ensures that their perceptions are taken care of in order to speed the rate of adoption. Appropriate client orientation mechanism in the form of participatory rural appraisal (PRA) is being done in order to generate basic data for varietal specification and decide stage and levels of participation of farmers. The increased speed of PPB in producing results is one of its major advantages because the speeds at which benefits achieved from investment in plant breeding significantly affect the rate of return.

An alternative approach such as Farmers Participatory Varietal Selection (PVS) is considered to address the problems of the limited varietal choices available to farmers. Such programme to involve farmers will help to produce farmer acceptable cultivars more effectively. So it is intended that PVS would minimize resources use, produce cultivars that are acceptable to farmers, and increase the genetic diversity of brown sarson in participatory village and also to determine most suitable cultivars that are highly acceptable and above all, to determine most suitable cultivars for high altitude ecology of Kashmir. Keeping in view the above considerations, the present investigation was carried out by evaluating 10 genotypes including two checks Shalimar sarson-1 and farmer's variety of brown sarson over a set of diverse environments with the objectives of understanding farmer's perceptions and preferences about oleiferous varieties through Participatory Rural Appraisal (PRA) and evaluating breeders material on farmer's fields using farmer's selection indices and criteria through mother trials.

MATERIALS AND METHODS

The investigation entitled "Participatory Varietal Selection in Brown sarson (*Brassica rapa* L.)" was conducted during rabi 2013-14 in three districts of Kashmir valley viz., Anantnag, Pulwama and Kulgam. In each district two locations were selected to lay out the trials. The basic material for the study comprised 10 genotypes of *Brassica rapa* var. brown sarson Each genotype was grown in a 3-row experimental plot of 3 metre length with inter and intra row spacing of 30 and 10 cm, respectively. The experimental fields were well prepared and all the recommended packages were adopted to raise a good crop. Two villages were selected each in districts of Anantnag, Kulgam and Pulwama. One farmer at each site was identified for laying mother trials. Participatory Rural Appraisal was conducted prior to lying of trials at the selected sites. Fifty households from each site were surveyed using pre-designed Household Level Questionnaire (HLQ) to identify production constraints as well as the farmer's perception about varietal specifications. Preference data was gathered by using preferential analysis (PA). A group of farmers were allowed to vote for their preferred genotypes during farm walk day by depositing paper ballots in a bag or envelope in front of each plot. During the farm walk the bag was placed in front of each plot in the trial, and the bag served as ballot box for genotype. Each farmer was given two ballots of different color and was asked to vote for most and least preferred variety as per their own selection and preferential indices. The preferential score was calculated as[3]:

$$PS = \frac{\text{No. of positive votes} - \text{No. of negative votes}}{\text{Total No. of votes}}$$

The present investigation was carried out to generate information on the adaptive potential and stability parameters of ten diverse genotypes of brown sarson. These genotypes were evaluated in a Randomized Complete Block Design (RCBD) with three replications across three random environments.

RESULT AND DISCUSSION

In the present investigation ten genotypes including two checks were evaluated in Mother trials through farmer's preferential ranking at four locations laid out in the farmer's fields. Just one week before harvest, Focal Group Discussions (FGD) were used to evaluate the varieties. At village Wanpoh (Anantnag) highest preferential scoring i.e. lowest rank value was recorded on KBS-49 followed by KBS-33 and KBS-38. The lowest preference was recorded for KS-101. Similarly at village Malangpora, Pulwama (Table-2) maximum scoring was recorded for KBS-33and the minimum for Farmers check (10). At Lethpora (Pulwama) village KBS-49 received maximum number of votes and was followed by KBS-33, KBS-38 and KBS-28. The maximum farmer's votes were recorded for KBS-49(1) followed by KBS-33(2), KBS-38 (3) and so on at village Roohpura (Kulgam), while as maximum number of negative votes were recorded for farmer's check(10). At Research Stations most preferred variety was KBS-49 and KBS-33. The variety that received maximum number of negative votes was KS-101. There was significant interaction between varieties and locations as observed from the data of preferential ranking. Most of the variations in ranking between sites were for the lower ranked entries. The reasons came to be known for the preference were related to many traits including high oil and seed yield, early maturity, tall stature, good germination percentage and free from diseases.

PRA was conducted by selecting 50 households from. The sites were selected from high altitude areas eight each from Districts of Anantnag, Pulwama and Kulgam to identify background information, production constraints as well as the farmer's perception about varietal specification of brown sarson crop. There were 23 easy questions in the questionnaire and the questions were asked in vernacular language and were filled in by the researcher himself after listening to the replies. When farmers were asked about the source of irrigation system, it was found that crop is mostly rainfed. The data revealed that rains contribute 100% as part of irrigation system, though little irrigation is assured at the time of sowing wherever enough moisture is not available (Table 1 to 1.4).

Household Level Questionnaire (HLQ) conducted was composed of few questions regarding the constraints in Brown sarson crop production. In this regard farmers were asked whether it was low yielding varieties or diseases as major constraints in rice production. The comparison data revealed that low yielding varieties was found to be a significant factor in limiting brown sarson crop production and diseases rank second as production constraints. The low yielding varieties are the major production constraints and observed data in this regard ranged from 62.5-81.4 per cent with a mean percentage of 71.5 per cent. Similarly the data of biotic stress under which losses due to diseases verses insect pest damage was compared and it revealed that former effect was highly significant, rather the effect of insect damage has been felt economically important by the brown sarson growing farmers. In totality 45.84 % farmers considered the diseases as more important and 54.16% farmers felt the issue of aphids to be more severe.

Among abiotic challenges, cold stress was felt by the significant proportion of the selected farmers and water stagnation affecting the brown sarson production was also felt by the farmers. The comparison of cold verses water stagnation revealed that former was felt by 75.50 per cent and later by 24.50 per cent to be the most economically important brown sarson production constraints. Cold stress is a big issue particularly at initial stages of crop growth was assessed by most of the farmers and ranged between 62.50-84.21 per cent (Table-2). Water stagnation was of lesser occurrence and varied between15.79-39.02 per cent. More than half (55.63%) of total farmers use their own saved seed and 23.94 per cent get it through farmer to farmer exchange while as other sources and institute contributing 8.47 and 11.96 per cent. respectively. One important information was that the private market has little role in brown sarson seed supply. The non-significance of test of comparison of farmer's seed verses other classes as a group revealed equal contribution of these two seed sources. Household Level Questionnaire (HLQ) conducted to design the new varieties and to set breeding objectives, the questionnaire consisted of some questions to seek preferences regarding plant phenology and grain characteristics and some post-harvest traits. Tall stature was a highly desirable trait against medium. The mean percentage of liking for tall stature was 85.09 per cent and medium stature was on an average preferred by 14.91 per cent. There was no preference for dwarf nature of the plant.

There was a highly significant aspiration for long pod length when compared to the medium length of the pod. Farmers attributed that long pod means high yield for them. The mean preferential percentage with respect to long and medium pod length was 79.88 and 20.12 per cent, respectively. Regarding pod texture, the questionnaire revealed that smooth pod texture was highly aspired by the farmers in comparison to undulated one. The mean preferential percentage with respect to smooth and undulated pod texture was 65.07 and 34.93 per cent respectively. Regarding seed quality, farmers favored high germination percentage of varieties in addition to seedling vigour. The mean percentage preference for high germinating varieties was 65.07 per cent. There was 34.93 per cent preference for high seedling vigour as well. Early maturing varieties would be the most preferential trait liked by the farmers. The test of significances of early maturity verses high yield was significant and early maturing trait was preferred by 67.88 per cent of the selected farmers over the 32.12 per cent of high yield preferably in order to avoid sacrificing of high yielding varieties over paddy crop. The non-significance of χ^2-test for the comparative preference of high seed yield verses high oil content revealed equal importance of both the aspects for fetching good price in the market. The mean percentage of preference for high seed yield and high oil content was 55.38 and 44.62 per cent, respectively. Bold seeded varieties were mostly preferred by farmers. The mean percentage of preference for pod filling and oil content was 74.00 and 26.00 per cent, respectively. Mostly brown seeded varieties were preferred by farmers over yellow and the mean preference shown was 69.60 and 30.40 respectively. Mostly farmers preferred high oil yield over quality oil yield being unaware of the anti-nutritional factors associated with the Brown sarson crop (Table 1-1.4).

Evaluation of Mother Trials through farmer's preferential ranking was carried out at six locations at all trials laid out in the farmer's fields. Just one week before harvest, Focal Group Discussions (FGD) were used to evaluate the varieties. Plot measurements were taken by the researcher but managed by the farmer. There was very good response from the farmers who not only cooperated while laying out the trials in their area but actively participated in preferential ranking of the varieties voting. The variety that received maximum number of negative votes was KS-101. At village Malangpora (Pulwama) (Table-2) highest preferential scoring i.e. lowest rank value was recorded on KBS-33 followed by KBS-38 and KBS-49. The lowest preference was recorded for KS-101(10). Similarly at village Lethpora Pulwama maximum scoring was recorded for KBS-49 (1) and the minimum for SBS-1(10). The genotypes KBS-49 was followed by KBS-33 and KBS-38 as per the desirability assessed by the farmers. At Roohpura (Kulgam) village genotype KBS-49 received maximum number of votes and was followed by KBS-33, KBS-5 and KBS-38. The maximum number of farmer's votes was recorded for KBS-38 followed by KBS-49, KBS-KBS-33and so on at village Surat (Kulgam), while as maximum number of negative votes were recorded for farmer's check (10). There was significant interaction between varieties and locations as observed from the data of preferential ranking. Most of the variations in ranking between sites are for the lower ranked entries. (Table-3) gives the picture of rank summation preferential data for different test entries as collected from six mother trials and evaluated by 110 farmers including the ones who grow the trials on their farm. Lowest cumulative rank that is the most preferred variety was recorded on KBS-49 with mean preference rank of 1.5 and KBS-33 identified as second best (2) and followed by KBS-38 (2.5). Clearly shows that KBS-49, KBS-33 and KBS-38 were statistically at par in term of rank summation index and mean preference ranking and significantly different with the test entries KBS-69, KBS-5, KBS-40 and KBS-28 which among themselves could be categorized as one group. KS-101 was least preferred variety. The interviews from most of the farmers revealed that the reasons for the preference for a genotype were related to many traits including high biomass (biological yield), grain yield, early maturity, good plant height (100-110 cm) and also were free from diseases. Witcombe *et al*[9]., reviewed the history and analyzed the participatory techniques to rice varieties derived from client oriented breeding programmes through Mother and baby trials system in Bangladesh. The rapid acceptance of these varieties by farmers illustrates the power of participatory trial system. Gyawali *et al*[6]., screened 142 accessions through collaborative selection for quality varieties and few were finally proven to be generally superior for post-harvest traits in Pokhra valley of Nepal using local preferences and selection[7,8] using Mother and Baby trial design, led to release of population 22 in 2002 through preferences by farmers that had previously escaped identification. The genotypes KBS-49 and KBS-33 were identified by the farmers through their perceptions for traits like earliness, tall stature, good seed and oil yield and without diseases. These varieties are therefore suggested for these niches after validation of results through multi-locations and to confirm the real performance and after revalidation are recommended for last stage of Participatory Plant Breeding (PPB) which participatory seed production for up scaling.

Table 1: Participatory Rural Appraisal (PRA) at 16 locations for understanding farmers' perceptions and preferences about *Brassica rapa* var. brown sarson varieties

Location (L)	N	R	Background information					
			Farming practices	Irrigation system				
			Sole crop	Intercrop	Mixed crop	Assured irrigation	Rainfed	
L-1	Gangipora	50	36	23 (63.89)	10 (27.77)	3 (8.33)	0 (0.00)	36 (100)
L-2	Khudwani	50	44	34 (77.27)	6 (13.63)	4 (9.09)	0 (0.00)	44 (100)
L-3	Wanpoh	50	41	33 (80.49)	4 (9.75)	4 (9.75)	0 (0.00)	41 (100)
L-4	Qaimoh	50	38	36 (94.74)	2 (5.26)	0 (0.00)	1 (2.63)	39 (97.37)
L-5	Botengo	50	38	34 (89.47)	2 (5.26)	2 (5.26)	0 (0.00)	38 (100)
L-6	Harnag	50	43	38 (88.37)	3 (6.97)	2 (5.26)	2 (4.65)	41 (95.35)
L-7	Padgampora	50	40	32 (80.00)	5 (12.5)	3 (7.5)	1 (2.50)	39 (97.50)
L-8	Awantipora	50	38	32 (84.20)	6 (15.80)	2 (5.26)	0 (0.00)	38 (100)
L-9	Beghpoora	50	42	34 (80.95)	6 (14.28)	2 (4.76)	0 (0.00)	42 (100)
L-10	Malangpora	50	41	33 (80.49)	8 (19.51)	0 (0.00)	1 (2.44)	40 (97.56)
L-11	Lethpora	50	38	33 (86.84)	3 (7.89)	2 (5.26)	0 (0.00)	38 (100)
L-12	Surat	50	36	32 (88.89)	2 (5.55)	2 (5.55)	0 (0.00)	36 (100)
L-13	Roohpura	50	43	35 (81.39)	5 (11.62)	8 (18.60)	2 (4.65)	41 (95.35)
L-14	Chadder	50	40	32 (80.00)	6 (15.00)	2 (5.00)	0 (0.00)	40 (100)
L-15	Brazloo	50	42	32 (76.19)	7 (16.66)	3 (7.14)	2 (4.76)	40 (95.24)
L-16	Ashmuji	50	45	37 (82.22)	4 (8.88)	4 (8.88)	1 (2.22)	44 (97.78)
χ^2	**(166.57)**	**(306.47)**						

Table 1.2: Participatory Rural Appraisal (PRA) at 16 locations for understanding farmers' perceptions and preferences about *Brassica rapa* var. brown sarson

Location (L)		Varietal specification								
		Plant stature		Pod length			Pod texture		Seed quality	
		Tall	Medium	Long	Medium		Smooth	Undulated	Germination (%)	Seedling vigour
L-1	Gangipora	34 (94.44)	2 (5.56)	25 (69.44)	11 (30.56)		18 (51.43)	17 (48.58)	18 (51.43)	17 (48.58)
L-2	Khudwani	34 (84.09)	8 (18.18)	25 (77.27)	10 (22.73)		22 (52.38)	20 (47.61)	22 (52.38)	20 (47.61)
L-3	Wanpoh	34 (92.68)	3 (7.32)	25 (78.07)	9 (21.95)		21 (55.27)	17 (44.74)	21 (55.27)	17 (44.74)
L-4	Qaimoh	32 (84.21)	6 (15.79)	25 (76.32)	9 (23.68)		17 (44.47)	21 (55.26)	17 (44.47)	21 (55.26)
L-5	Botengo	32 (84.49)	6 (16.22)	25 (78.38)	9 (24.32)		33 (80.48)	8 (19.51)	33 (80.48)	8 (19.51)
L-6	Harnag	34 (88.37)	5 (11.63)	25 (76.74)	10 (23.26)		34 (79.07)	9 (20.93)	34 (79.07)	9 (20.93)
L-7	Padgampora	28 (70.00)	12 (30.00)	25 (95.00)	2 (5.00)		36 (90.00)	4 (10)	36 (90.00)	4 (10)
L-8	Awantipora	34 (86.84)	4 (13.16)	25 (94.74)	2 (5.26)		25 (65.79)	13 (34.22)	25 (65.79)	13 (34.22)
L-9	Beghpoora	34 (85.71)	6 (14.29)	25 (76.19)	10 (23.81)		18 (45.00)	22 (55.00)	18 (45.00)	22 (55.00)
L-10	Malangpora	34 (82.93)	7 (17.07)	25 (75.61)	10 (24.39)		22 (52.38)	20 (47.61)	22 (52.38)	20 (47.61)
L-11	Lethpora	34 (89.47)	4 (10.53)	25 (76.32)	9 (23.65)		21 (51.21)	20 (48.78)	21 (51.21)	20 (48.78)
L-12	Surat	34 (88.89)	2 (11.11)	25 (88.89)	4 (11.11)		20 (57.15)	15 (42.85)	20 (57.15)	15 (42.85)
L-13	Roohpura	34 (83.72)	7 (16.28)	25 (76.74)	10 (23.26)		30 (78.94)	8 (21.06)	30 (78.94)	8 (21.06)
L-14	Chadder	33 (82.50)	7 (17.50)	25 (77.50)	9 (22.50)		34 (79.07)	9 (20.93)	34 (79.07)	9 (20.93)
L-15	Brazloo	34 (80.95)	8 (19.50)	25 (78.57)	9 (21.43)		36 (90.00)	4 (10)	36 (90.00)	4 (10)
L-16	Ashmuji	37 (82.22)	8 (17.78)	25 (82.22)	8 (17.78		26 (68.42)	12 (31.57)	26 (68.42)	12 (31.57)
X^2 - value		**(156.25)**		**(119.5)**			**(56.49)**		**(56.49)**	

Table 1.3: Participatory Rural Appraisal (PRA) at 16 locations for understanding farmers' perceptions and preferences about *Brassica rapa* var. brown sarson

Location (L)	**Economic traits**	**Yield**	**Size**				
	Early maturing	**High yield**	**High grain**	**High oil content**	**Bold**	**Small**	
L-1	Gangipora	20 (57.15)	15 (38.10)	15 (41.67)	21 (58.34)	27 (75.00)	9 (25.00)
L-2	Khudwani	30 (71.42)	12 (28.57)	25 (59.52)	17 (40.47)	31 (70.45)	13 (29.58)
L-3	Wanpoh	28 (73.68)	10 (26.31)	20 (54.05)	17 (45.94)	32 (78.05)	9 (21.95)
L-4	Qaimoh	25 (65.79)	13 (34.21)	23 (60.52)	15 (39.47)	27 (71.05)	11 (28.95)
L-5	Botengo	30 (73.17)	11 (26.82)	25 (65.78)	13 (34.21)	27 (72.97)	11 (29.73)
L-6	Harnag	26 (60.47)	17 (39.52)	20 (51.28)	19 (48.71)	35 (81.40)	8 (18.60)
L-7	Padgampora	26 (65.00)	14 (35.00)	15 (37.5)	25 (62.50)	32 (80)	8 (20)
L-8	Awantipora	29 (76.32)	9 (23.68)	30 (78.95)	8 (21.05)	32 (84.21)	6 (15.79)
L-9	Beghpoora	24 (61.90)	16 (38.10)	20 (50.00)	20 (50.00)	30 (71.43)	12 (28.57)
L-10	Malangpora	30 (71.42)	12 (28.57)	16 (39.02)	25 (60.97)	31 (75.61)	10 (24.39)
L-11	Lethpora	28 (68.29)	13 (31.71)	15 (39.47)	23 (60.52)	28 (73.68)	10 (26.32)
L-12	Surat	25 (71.43)	10 (28.58)	15 (44.11)	19 (55.88)	27 (75.00)	9 (25.00)
L-13	Roohpura	25 (65.57)	13 (35.14)	22 (53.65)	19 (46.35)	28 (65.12)	15 (34.88)
L-14	Chadder	26 (60.47)	17 (39.52)	20 (50.00)	20 (50.00)	27 (67.50)	13 (32.50)
L-15	Brazloo	26 (65.00)	14 (35.00)	15 (35.71)	27 (64.28)	30 (71.43)	12 (28.57)
L-16	Ashmuji	30 (78.94)	8 (21.05)	23 (51.11)	22 (48.88)	32 (71.11)	13 (28.89)
χ^2		**(39.5)**	**(15.66**		**(76.2)**		

Table 1.4: Participatory Rural Appraisal (PRA) at 16 locations for understanding farmers' perceptions and preferences about *Brassica rapa* var. brown sarson

Location (L)	**Economical traits**					
	Seed colour	**Oil content**				
	Yellow	**Brown**		**High**	**Quality**	
L-1	Gangipora	12 (33.33)	24 (66.67)		27 (75.00)	9 (25.00)
L-2	Khudwani	13 (29.55)	31 (70.45)		37 (84.09)	7 (15.91)
L-3	Wanpoh	13 (31.71)	28 (68.29)		37 (90.24)	4 (9.76)
L-4	Qaimoh	13 (34.21)	25 (65.79)		31 (81.58)	7 (18.42)
L-5	Botengo	13 (35.14)	25 (67.57)		31 (83.78)	7 (18.92)
L-6	Harnag	15 (34.88)	28 (65.12)		36 (83.72)	7 (16.28)
L-7	Padgampora	11 (27.50)	29 (75.50)		37 (92.50)	3 (7.50)
L-8	Awantipora	13 (34.21)	25 (65.79)		31 (81.58)	7 (18.42)
L-9	Beghpoora	12 (28.57)	30 (71.43)		37 (88.10)	5 (11.90)
L-10	Malangpora	11 (26.83)	30 (73.17)		36 (87.80)	5 (12.20)
L-11	Lethpora	10 (26.32)	28 (73.68)		33 (86.84)	5 (13.16)
L-12	Surat	10 (27.78)	26 (72.22)		33 (91.67)	3 (8.33)
L-13	Roohpura	12 (27.91)	31 (72.09)		38 (88.37)	5 (11.63)
L-14	Chadder	12 (30.00)	28 (70.00)		33 (82.50)	7 (17.50)
L-15	Brazloo	12 (28.57)	30 (71.43)		32 (76.19)	10 (23.81)
L-16	Ashmuji	16 (35.56)	29 (64.44)		37 (82.22)	5 (11.11)
χ^2	**(49.33)**			**(157.89)**		

Table 2: Farmers preference ranking (scoring) of different test varieties of brown sarson in mother trails at four locations

Genotypes	Wanpoh, Anantnag (n=33, f=25)	Malangpora, Pulwama (n=20, f=16)	Lethpora, Pulwama (n=25, f=20)	Roohpura, Kulgam (n=18, f=15)				
	Positive votes	**Preferential scoring**	**Positive votes**	**Preferential scoring**	**Positive votes**	**Preferential scoring**	**Positive votes**	**Preferential scoring**
KBS-69	13	0.04	9	0.13	8	0.06	10	0.00
KBS-33	20	0.60	15	0.88	13	0.73	18	0.80
KBS-49	22	0.76	13	0.63	14	0.86	19	0.90
KBS-38	19	0.52	14	0.75	11	0.46	16	0.60
KBS-5	17	0.36	7	-0.13	5	0.03	9	-0.10
KBS-40	15	0.20	11	0.38	7	-0.06	15	0.50
KBS-F	13	0.04	4	-0.50	4	-0.46	7	-0.30
KBS-28	16	0.28	8	0.00	9	0.20	15	0.50
KS-101	10	-0.20	7	0.13	4	-0.46	11	0.10
SBS-1	14	0.12	10	0.25	6	-0.20	8	-0.20

n= Number of farmers assembled

f= Effective number of farmers who participated in preferential scoring

Table 3: Cumulative/ average ranks of genotype over four locations

Genotypes	Individual ranks	Cummulative rank	Average of ranks	Pooled preference			
	Location I	**Location II**	**Location III**	**Location IV**			
KBS-69	8	7	5	6	26	6.50	0.225
KBS-33	2	1	2	2	7	1.75	3.005
KBS-49	1	3	1	1	6	1.50	3.145
KBS-38	3	2	3	3	11	2.75	2.330
KBS-5	4	9	6	7	26	6.50	0.165
KBS-40	6	5	7	4	22	5.50	1.015
KBS-F	8	11	9	9	37	9.25	-0.030
KBS-28	5	8	4	4	21	5.25	0.980
KS-101	9	9	9	5	32	8.00	-0.685
SBS-1	7	6	8	8	29	7.25	-1.220

CONCLUSION

Participatory Rural Appraisal (PRA) conducted before laying out the research trials revealed that sole-cropping is usually in vogue and the crop is mostly rain fed. Among major production constraints, low yielding varieties, diseases and insect prevalence, non-availability of quality seed, cold and water stagnation were considered important and farmers saved seed of conventionally grown varieties is the main source of seed to raise the new crop. Further, the farmers would like to demand the variety possessing tall stature, long pod length, high germination %age, medium bold seed, early maturity, brown seed coat and high oil content.

The preferential scoring of test genotypes revealed that most preferred genotype on the basis of lowest cumulative rank was KBS-49 with mean preference rank of (1.5) and KBS-33 as second best (1.75) followed by KBS-38 (2.75). The genotype that received maximum number of negative votes was KS-101(8.00). Farmers who grow the trial and the neighbors of those farmers, expressed a consistent large and highly significant preference for KBS-49, KBS-33 and KBS-38 compared with the SBS-1 (popular variety) and the farmers variety. Also genotypes KBS-28, KBS-69, KBS-40 and KBS-5 were statistically found at par in term of rank summation index and mean preference ranking. Based on the findings of the present study, it could be summarized as PRA gave cognizance to breeders to breed for such varieties which should possess high seed and oil yield together with insect resistance, cold tolerance, bold seed, tall stature, high germination % age and brown seed coat preferably with high oil content. The most preferred genotypes identified by the Focal Group Discussion through PVS were KBS-49 and KBS-33. These genotypes needs to be evaluated further by Baby Trial evaluation system on big plot size and over many more locations to corroborate the real performance and finally to recommend the varieties for up scaling through Participatory Seed Production under such ecologies.

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