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Short Note

Varietal and spatial distribution of kidney bean seed mycoflora in Himachal Pradesh

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Kidney bean (*Phaseolus vulgaris* L.) is a prime pulse crop among various grain legumes and is an excellent source of relatively cheap dietary protein. It is commercially grown in various agro-ecological zones ranging from sub-tropical to dry temperate regions in Himachal Pradesh during April-May to September–October

One hundred gram of green pods contain protein (1.7 g), fat (0.1 g), carbohydrate (4.5 g), fiber (0.8 g) and minerals (0.5 g) (Aykroyd,1983) Whereas, dry beans contain protein (22.9 g), fat (1.3 g), carbohydrate (60.6 g) and minerals (3.2 g) (Gopalan *et. al.*, 1982). The green pods of French bean contain traces of glycosides and certain other substances that reduce blood sugar levels besides high protein contents (15-31%) that make it an excellent substitute for animal protein in the diet of predominantly vegetarian Indian population. India is a major pulse producing country of the world occupying an area of 228.47 lac hectares with the production of 130.7 lac tones and yield to the tune of 572 kg/ha. Himachal Pradesh occupies nearly 2037 ha of area with production of 19,206 metric tonnes rajmash (Anonymous, 1999).

One of the most important basic needs of higher agricultural productivity is quality seed, characterized by high viability and vigour (Yaklich *et al.*, 1979) which tend to decline with the age of seed and in turn determine the crop stand and finally production (Roberts, 1972; Singh and Gupta, 1982). These two factors are highly affected by quality of seeds and storage containers used for their storage. Therefore, to realize full potential of bean seed, maintenance of seed viability and vigour from harvest till next growing season is of utmost importance. The survey was undertaken to observe varietal and spatial distribution of kidney bean varieties, storage containers and mycoflora recorded on them in various agro-ecological zones of Himachal Pradesh.

Collection and maintenance of seed samples

Seed samples of kidney bean comprising of local and improved varieties were collected from different commercial bean growing areas of Himachal Pradesh representing diverse agro-climatic situations. In all, 73 samples were collected from different locations of Chamba, Kangra, Kinnaur, Kullu, Lahaul- Spiti, Mandi and Shimla districts of the state. Sampling was done after harvesting of crop in October and after storage in May before sowing of the crop. At least 500 g sample was collected from each location in accordance with rules formulated by International Seed Testing Association (ISTA, 1976). Information, was recorded on place of collection, type of cultivar grown, date of collection and storage conditions etc. from the farmer of each location. The samples were catalogued and kept in labeled cloth bags at room temperature for further investigations under laboratory conditions.

Grading of seed samples

The seed samples (500 seeds/lot) were examined critically and grouped into three categories on the basis of their morphological traits/external symptoms according to the methods followed by Lokhande *et al.*(1986) with slight modifications as follows:

a) Apparently healthy seeds
b) Shriveled seeds
c) Discoloured seeds

Varietal and spatial distribution of seed mycoflora

Information collected on cultivars used; method of storage etc. revealed forty five samples from Zone-III, whereas, number of samples collected from Zone-II and IV were 9 and 19, respectively. The potential kidney bean growing areas included Chamba, Kangra, Kinnaur, Kullu, Lahaul-Spiti, Mandi and some parts of Shimla district. Information gathered from farmers of different areas revealed that they generally used their own seed year after year and local land races dominated the recommended varieties. Out of 73 seed samples, 49 were of local land races and remaining 24 were of recommended varieties. Farmers generally use gunny bags for storage of

Table 1. Collection of kidney bean seed samples from different locations of Himachal Pradesh and their grading for seed pathological studies

Agro-climatic zone	District/ Location	Line/ Variety	Storage condition	Sample number	Proportion of seeds in different grades (%)		
					Apparently healthy	Shrivelled	Discoloured
Zone II	**Kangra**						
	Kandwari	Local	Gunny bag	KB 1	92.0	4.0	4.0
	Palampur	Baspa	Wooden bin	KB 2	98.3	1.6	1.0
		Triloki	Wooden bin	KB 3	96.8	2.8	0.4
		Kanchan	Wooden bin	KB 4	97.8	2.0	0.4
		Contender	Gunny bag	KB 5	60.0	40.0	4.0
		Laxmi	Gunny bag	KB 6	96.0	4.0	2.0
		SVM 1	Gunny bag	KB 7	98.0	2.0	2.0
		Kentucky Wonder	Gunny bag	KB 8	96.0	10.0	2.0
		Hans	Gunny bag	KB 9	93.0	9.0	3.0
Zone III	**Chamba**						
	Dayur	Local	Gunny bag	KB 10*	91.0	9.0	3.8
	Guner	Local	Gunny bag	KB 11	77.0	18.6	1.1
	Kathayari	Local	Gunny bag	KB 12*	86.2	13.4	4.0
	Kuntlehri	Local	Gunny bag	KB 13	85.8	3.4	2.0
	Lahal	Local	Gunny bag	KB 14	87.6	5.6	4.6
	Salooni	Local	Gunny bag	KB 15*	78.4	18.4	3.2
		Jawala	Gunny bag	KB 16*	86.4	9.6	3.2
		Kanchan	Gunny bag	KB 17*	98.3	1.6	1.0
		Jawala	Gunny bag	KB 18*	96.8	2.8	0.4
		Him 1	Gunny bag	KB 19*	97.8	2.0	0.4
		Triloki	Gunny bag	KB 20*	83.6	16.0	1.1
	Surgani	Jawala	Gunny bag	KB 21	69.6	30.4	3.0
	Kangra						
	Bara Bhangal-1	Local	Gunny bag	KB 22	75.6	24.4	6.0
	Bara Bhangal-2	Local	Wooden bin	KB 23	63.2	36.8	7.0
	Kothikohr	Local	Wooden bin	KB 24	73.8	26.2	5.4
	Lohardi	Local	Metallic bin	KB 25	77.2	22.8	2.0
		Local	Metallic bin	KB 26	77.6	22.4	1.6
		Local	Metallic bin	KB 27	91.2	4.4	1.6
	Multhan	Local	Metallic bin	KB 28	68.8	31.2	2.4
	Nalhata	Local	Metallic bin	KB 29	85.0	15.0	2.0
	Rajgundha-1	Local	Gunny bag	KB 30	89.6	7.0	0.4
	Rajgundha-2	Local	Gunny bag	KB 31	90.0	7.6	1.2
	Salar	Local	Wooden bin	KB 32	82.0	16.0	1.0
	Kullu						
	Drilahari	Local	Gunny bag	KB 33*	93.6	4.0	2.4
	Ghyagi	Local	Metallic bin	KB 34	94.0	3.0	2.0
	Kamand	Local	Gunny bag	KB 35	81.2	18.0	0.8
	Kao	Local	Gunny bag	KB 36	86.8	8.8	4.4
	Kotla	Local	Gunny bag	KB 37	83.2	4.8	3.0
	Naggar	Local	Gunny bag	KB 38	70.0	22.0	8.0
	Palchaan	Local	Gunny bag	KB 39	81.2	2.0	4.8
	Rujjag	Local	Wooden bin	KB 40	72.6	23.0	4.4
	Rohanda-1	Local	Metallic bin	KB 41	62.0	25.0	5.6
	Rohanda-2	Local	Gunny bag	KB 42	91.4	5.2	3.4
	Mandi						
	Banah	Local	Metallic bin	KB 43	99.6	4.8	0.8
	Barot	Local	Wooden bin	KB 44	96.0	13.4	2.0
	Koteru	Local	Gunny bag	KB 45	97.4	4.6	0.8
	Lassar	Him 1	Gunny bag	KB 46	96.4	6.2	0.2
	Nau	Local	Wooden bin	KB 47	90.0	6.0	5.0
		K 198	Wooden bin	KB 48	96.2	4.0	3.0
		Kanchan	Wooden bin	KB 49	82.0	18.0	1.0
		Local	Wooden bin	KB 50	77.0	20.0	11.0
	Shimla						
	Cheog	Local	Gunny bag	KB 51	62.0	40.0	20.0
	Kumarsain	Local	Gunny bag	KB 52	65.0	22.0	5.0

	Sawra	Local	Metallic bin	KB 53*	96.0	10.0	2.0
	Shilaru	Local	Gunny bag	KB 54	93.0	9.0	3.0
Zone IV	**Chamba**						
	Holi	Local	Gunny bag	KB 55*	93.6	2.8	2.4
	Parmas	Local	Metallic bin	KB 56*	92.8	6.8	2.0
	Purthi	Local	Metallic bin	KB 57*	95.6	4.8	2.0
	Shour	Local	Metallic bin	KB 58*	69.6	30.4	5.8
		Local	Metallic bin	KB 59*	87.6	6.2	6.0
		Local	Gunny bag	KB 60	70.0	30.0	5.0
	Gompathang	Him 1	Gunny bag	KB 61	89.6	8.4	2.0
	Hinsa	Him 1	Metallic bin	KB 62*	79.5	20.0	1.5
		Local	Gunny bag	KB 63	92.8	2.8	6.4
	Jahlma	Him 1	Gunny bag	KB 64	77.0	23.0	1.5
	Kukumseri	Local	Gunny bag	KB 65*	94.0	4.6	1.4
		Local	Gunny bag	KB 66*	99.0	10.0	0.4
	Shakoli	Him 1	Gunny bag	KB 67	99.2	10.6	0.6
		Local	Gunny bag	KB 68	98.4	6.2	1.2
	Kinnaur						
	Ribba	Jawala	Gunny bag	KB 69	85.6	11.6	3.0
	Sangla	KRC 8	Wooden bin	KB 70	92.0	10.0	2.0
		Local	Gunny bag	KB 71	90.0	9.0	1.0
		Local	Gunny bag	KB 72	72.2	20.6	7.2
		Local	Gunny bag	KB 73	75.8	17.6	6.6

* Samples collected after harvest

seeds followed by metallic and wooden bins. Zone III and IV constitute the main bean producing areas of the state and wide variation in climatic conditions exists in these zones. Zone III has sub-tropical/ sub temperate type of conditions with comparatively high rainfall whereas, Zone IV possess wet to dry temperate type of climate with an annual rainfall ranging between 250 - 400 mm, though both conditions are suitable for quality bean cultivation.

Grading of kidney bean seed samples for seed pathological studies

Different seed samples were categorized on the basis of their morphological appearance into three grades viz. apparently healthy, shrivelled and discoloured. Frequency of seeds in each category is presented in Table1. The percentage of different graded seeds among 73 samples ranged between 60.0 - 99.6, 1.6 - 40.0 and 0.4 - 20.0 per cent, respectively, in different agro-climatic zones.

The percentage of apparently healthy seeds was highest in Zone III (99.6%), followed by Zone IV (99.2%). However, maximum numbers of shrivelled seeds were noticed in seed lots representing Zone III where samples KB 5, KB 51 and KB 23 showed 40 and 36.8 per cent shrivelled seeds and samples KB 51 had 20 per cent discoloured seeds. The frequency of discoloured seeds was highest in Zone III. Minimum percentage of abnormal seeds was observed in Zone IV, where some of the samples were absolutely free of any visible infection.

Seed samples of recommended varieties (Table 1) revealed that cultivar Him 1 (Zone IV) showed the presence of minimum number of abnormal seeds whereas, Contender possessed the maximum. In general, the local land races possessed more abnormal seeds in comparison to recommended ones. Maximum number of abnormal seeds was observed in the samples procured from Zone III and minimum from Zone IV. Different climatic conditions prevailing in these two zones might have accounted for such type of abnormalities as temperate conditions prevalent in Zone IV are more suitable for general host growth whereas, in Zone III frequent and high rainfall along with comparatively higher temperature during cropping season also favour the conditions (biotic and abiotic) which might lead to such type of abnormalities. Consequently, these conditions affected the general plant growth and seed health during and after harvesting of crop. (Tarr, 1955; Frederiksen, 1974; Neergaard, 1977). Lokhande and Shinde (1986) also found various types of morphological abnormalities in French bean seeds harbouring variable number of mycoflora in Sitara district of Maharashtra.

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