EVALUATION OF PROMISING GENOTYPES OF FRENCH BEAN (*PHASEOLUS VULGARIS* L.) SUITABLE FOR NE INDIA

Abstract:

Eighteen genotypesof bush type French bean (*Phaseolus vulgaris*) collected from AICRP on Vegetable crops, Jorhat centre and different part of the state of Assam and North East were evaluated for green pod yield and component characters in station trialsconducted consecutively for 3 years in the Deptt. of Horticulture, AAU, Jorhat..The genotypes were tested in zonal trials covering UBVZ, LBVZ and NBPZ also. In these trials, among all genotypes, Arka Anup and Arka Suvidha were found to be the best for green pod yield ranging from 95 – 110 q/ha. The trials conducted in different AICRP centres which exhibited average pod yield of 149.1 q/ha in Arka Anup and 141.9 q/ha in Arka Suvidha. On an average there was 20 – 25% yield increase over the best check variety Contender. Arka Anup was a flat poded variety whereas Arka Subidha was a round poded variety. The edible green pods were getting ready for plucking at 60 - 70 days after sowing. Both of them were found to be tolerant to rust and bacterial blight. Theyhave been recommended in the ZREAC and ATCM meeting held at AAU for release in the state of Assam. In view of the consumer preference and taste, the varieties are spreading very fast and getting popularity throughout entire NE states. In the national level also they have been notified by the Central Seed Sub Committee for 3 zones of the country viz., I, V and VIII covering the states of North, Central and South India. Considering yield performance and other desirable characteristics, extensive cultivation of these varieties may be done in Assam and better performing states also.

Comment [A1]: Begin your abstact with a brief introduction, problem statement, objective of your study, method used and your findings

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Key Words :*French bean, Arka Anup, Arka Subidha, IIHR.*

INTRODUCTION:

French bean (*Phaseolus vulgaris* L) is the most important legume grown worldwide for human consumption (Singh, 1999). In the North Eastern Region including Assam, it is an important vegetable and is grown in a wide range of agro-climatic conditions ranging from plains to high

hills. Beans, 'the meat of the poor'(Pandey et al., 2011), contribute essential protein (22%) to the undernourished people living in hills. In this region, both pole and bush type beans are grown for their green pods as fresh vegetable and the dried seeds are used as pulse and for seed purposes. The foliage is consumed as fodder and is used to restore soil fertility. Pole type beans require bamboo sticks or jeng as support for climbing. This involves more cost of cultivation for this crop. Farmers therefore prefer bush type varieties instead of pole type ones.Some bush type varieties like 'Contender' and 'Pusa Parvaty' were introduced in this region long back but due to genetic degradation, desired yield and quality have not been achieved by the farmers. In view of this, attempt was therefore made to search for the alternatives which resulted in two high yielding varieties 'Arka Anup' and 'Arka Subidha' whose characteristics and field performance are presented in this paper.

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MATERIAL AND METHODS:

All total eighteen (18) elite breeding materials of bush type french bean were collectedfrom AICRP on Vegetable Crops from different coordinating centres of the country.The breeding lines and varieties included were FBBVar-1, FBBVar-2, FBBVar-3, FBBVar-4,FBBVar-5,FBBVar-6,FBBVar-7,DWDFB-1, DWDFB-53, DWDFB-57, MFB-2, IVFB-1, HAFB-4, RCMBF-1, Arka Anoop, Arka Subidha, Arka Komal and Contender. With these materials including 'Contender' as national and local check variety, the field experiment was conducted in the station trials during Rabi seasons at the Horticultural farm of the Assam Agricultural University, Jorhatconsecutively for 3 years.The seeds were sown in first fortnight of December every year. The experiment was laid out in a randomized block design with 3 replications. The size of the plot was 3.6 m x 3.0 m with a spacing of 40 cm between rows and 20 cm between plants. The FYM and NPK were applied as per package of practices recommended for french bean in Assam. The observations were recorded on different quantitative and qualitative characters as per descriptor of the NBPGR. Statistical analysis for yield and component characters was done following Panse and Sukhatme (1978). The best performing genotypes identified to be Arka Anup and Arka Subidha were tested in different climatic zones of Assam also. The reports on the performance data of these varieties were collected from AICRP centres and incorporated in this paper.

Comment [A7]: Specify the method used in collection breeding materials

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RESULTS AND DISCUSSION:

The analysis of variance of the station trials conducted at AAU for 3 years indicated highly significant differences among the genotypes. From the mean performance of yield estimated over years the genotypes showing high mean performance were Arka Anup and Arka Subidha which were significantly better than the check variety 'Contender'. The trialwise data and mean performance with respect to green pod yield of Arka Anup and Arka Subidha in comparison to check variety 'Contender' are presented in Table 1. For other characters pooled results are presented. For most of the characters except days to edible pod maturity and single pod weight, there was significant difference amongthe varieties.

Table 1 : Pod yield performance of Arka Anup and Arka Subidha at AAU, Jorhat

Entries/Trials	Arka Anup	Arka Subidha	Contender ©	CD(5%)	CV(%)
Station Trials	**Green pod yield (q/ha)**				
IVT	99.5	100.0	88.0	10.2	15.0
AVT-I	102.3	98.5	68.3	18.5	15.2
AVT-II	96.0	90.6	79.0	10.6	16.3
Mean	99.3	96.4	78.4	-	-
PC increase over check	26.5	23.0	-	-	-
Mean over trials					
Pods/plant	29.4	19.6	18.2	2.5	6.8
Days to edible pod maturity	77.8	80.2	79.9	-	-
Days to 50% flowering	39	43	36	2.7	3.0
Plant height(cm)	17	26	23	4.1	18.2
Pod length (cm)	16.0	22.8	14.8	1.5	4.2
Pod width (cm)	1.9	1.1	1.2	0.02	1.5
Single pod weight (g)	9.0	8.3	6.7	-	-

Both the varieties showed significantly higher yield than the check variety. Arka Anup (99.3 q/ha) exhibited higher mean pod yield than Arka Subidha (96.4 q/ha). The increase in pod yield was 26.5% in Arka Anup and 23.0% in Arka Subidha. For pods/plantalthough both the varieties were numerically superior to check, Arka Subidha was at par with 'Contender'.Arka Anup was some days earlier in flowering and edible pod maturity than the check variety whereas Arka Subidha was later. The percentage increase in green pod yield over the check variety in different zones of Assam was 24.99 %in Arka Anup and 28.03 % in Arka Subidha as shown in Table 2.

Table 2. Performance of French bean varieties in different climatic zones of Assam

Sl No.	Zones	Demonstration plots	Pod yield in (q/ha)		
			Arka Anup	Arka Subidha	Contender ©

1	UBVZ	Farmer's Field I	110.3	118.7	80.5
2	LBVZ	Farmer's Field II	120.5	122.5	90.5
3	NBPZ	KVK, Napam	89.8	87.2	85.5
4	Mean		106.86	109.47	85.5

Sl No.	Characteristics	Description		
5	(%) increase over check	24.99	28.03	

The trialwise pod yield performance of Arka Anup and Arka Subidha in better performing AICRP centres is presented in Table 3. The mean pod yield performance of the varieties over centres was 149.1 q/ha in Arka Anup which is 22.41 % higher than the best check variety 'Contender'. The mean performance of Arka Subidha was 141.9 q/ha which is 20.2 % higher than the best check variety 'Contender'. The results were in close conformity with the findings of Arun Kumar *et al.*, 2018 and Patu *et al.*, 2019.

Table 3. Performance of Arka Anup and Arka Subidha in AICRP Centres other than Jorhat

Sl No.	Name of the centres	Trial	Pod yield performance (q/ha)		
			Arka Anup	Arka Suvidha	Contender ©
1	IIHR	IET	189.0	-	179.0
		AVT-I	95.4	-	67.6
		AVT-II	-	188	157
2	Ranichauri	AVT-II	-	125	110
3	Almora	IET	130.55	-	121.3
		AVT-I	95.4	90.8	67.6
4	Bhubaneswar	AVT-II	-	66.3	65.0
5	Barapani	AVT-I	109.9	114.0	101.0
6	Solan	AVT-I	158.1	158.3	131.2
		AVT-II	-	88.2	82.8
7	HARP	AVT-I	341.8	273.9	235.0
		AVT-II	-	129.1	102.3
8	Srinagar	AVT-II	-	185.2	129.2
9	Jabalpur	IET	73.1	73.1	72.0
Average yield of varieties over centres			149.1	141.9	118.1
(%) increase in yield of the varieties over check			22.41	20.2	

Table 4 shows the morphological and other characteristics of the two varieties.Arka Anup was having dark green leaf pigmentation whereas Arka Subidha having light green pigmentation.

Table 4 : Morphological and other characters of the French bean varieties

		Arka Anup	**Arka Subidha**
1	Early Plant vigour	Good	Good
2	Plant growth habit	Bush	Bush
3	Stem pigmentation	Green	Light green
4	Flower wing colour	White	White
5	Leaflet length (cm)	11.6	11.8
6	Leaflet width (cm)	8.2	8.6
7	Leaflet shape	Linear lanceolate	Linear lanceolate
8	Pod colour	Light green	Light green
9	Orientation of pods	Prostate	Prostate
10	Leaf peak shape	Short beak	Straight
11	Pod pubescence	Sparse	Smooth
12	Pod shape	Curved	Straight
13	Pod curvature	Slightly curved	Straight
14	No. of marketable pod harvest	3	4
15	Green pod yield per plant (g)	200	180
16	Seed colour	Creamy	Brown
17	Seed mottling	Absent	Absent
18	Seed length (mm)	20	19
19	Seed width (mm)	10	9
20	No. of seeds per plant	8	10
21	100 seed weight (g)	1.0 – 1.2	1.1 – 1.3
22	Abiotic stress susceptibility	No or very low	No or very low
23	Biotic notes	Bacterial Blight rest.	Restt. to rust & Bact. Blt.
24	Root rot incidence	Low	Moderate

Fruit shapeis flat and little curved in Arka Anup and it is round and straight in Arka Subidha. Field study for occurrence of diseases has indicated that both the varieties were resistant to bacterial bight.Arka Subidha was resistant to rust also. Root rot incidence was low in previous one whereas it was moderate in late one. Rinkumoni and Sibani (2021) estimated the B:C ratio for these varieties to be 4.2 for Arka Anup and 4.8 fo Arka Subidha.

CONCLUSION:

From this investigation it could be concluded that Arka Anup and Arka Subidha were the best performing French bean varietieswhich have been recommended in the ATCM and ZREAC meeting held at AAU respectively for release in the state of Assam (Annonymous, 2019) . Accordingly, proposals of Arka Anup and Arka Subidha have already been submitted for their release in the state of Assam. In the national level, Arka Anup has beennotified for I, V & VIII Zones of India (Jammu &Kashmir, Himachal Pradesh, Uttaranchal, Madhya Pradesh, Orissa,

Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Lakha Deep) and Arka Subidha notified for Zone I and Zone VIII i.e. for the states of Himachal Pradesh and Karnataka (Personal Communication, 2012). The varieties have been conserved at NBPGR, New Delhi (Accession Nos. IC 585622 and IC 393734 respectively). In view of the yield performance, consumer preference and taste, the varieties are getting popularity in the state of Assam. The seeds of the varieties are available at IIHR, Bangalore.

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Comment [A9]: Adopted one system of referencing.

Fig 1 ARKA ANUP

fig 2 : ARKA SUVIDHA