

## STUDIES ON YIELD AND QUALITY OF FRENCH BEAN (*PHASEOLUS VULGARIS* L.) GENOTYPES, UNDER NET- HOUSE CONDITIONS

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**Abstract:** French bean is an important legume crop which is grown for its dry grain and tender pods in North-Western India. This off-season crop can be successfully raised in Punjab during winter season which fetches higher price in the market and economical to the farmers when there is no availability of green pods from high altitude. Hence, there is a great scope of cultivation of French bean under net-house conditions in Punjab. The present investigations were carried out in Department of Vegetable Science, PAU Ludhiana with the sole objective to indentify French bean genotypes suitable for cultivation under net-house conditions. Twenty genotypes were selected for green pod yield per plant, number of pods per plant, average pod weight (g). Based on the two year studies, the genotypes Falguni (350.19 g), Cosmo (329.86 g) and IIHR-909 (240.22 g) performed better under net-house conditions for total green pod yield per plant. Maximum number of pods per plant was recorded in genotype Falguni (52.33), Seville (50.83) and IIHR-909 (49.50) while maximum pod weight was elicited by genotypes Falguni (6.96g), Cosmo (6.11g) and DWP-FB-57 (5.78g) respectively.

**Keywords:** French bean, Green pod yield, Pod weight, Net-house

### INTRODUCTION

French bean (*Phaseolus vulgaris* L.) belongs to the family Fabaceae and it is native of South America. It is domesticated in Mexico, Peru and Colombia about 8000 years ago. French bean has evolved from wild growing vine distributed in the high lands of Middle-America and Andes. These two domestications, led to two groups of cultivars with contrasting agronomic characteristics. During this evolution, some marked changes has affected this plant from climbing to dwarf type which has taken place both in the middle American and Andean domestication centres as reported by (Schoonhoven and Vosyest, 1991). It is widely cultivated in tropics, sub tropics and temperate regions. In India and most of the tropical Asia, it is a major vegetable crop where indigenous pulses are also preferred (Adams, 1985).

French bean commonly known as kidney bean or snap bean or fine bean is one of the important vegetable crop among legumes. It is grown for tender green pods for fresh consumption as well as for dry seeds which are used as pulse. The dried beans are rich in protein and closely compare with meat. In India, it is mostly grown for tender green pods, while in the USA it is grown for processing in large quantities. This vegetable not only plays a vital role in nourishment of human population, but also improves soil fertility to a greater extent by virtue of being highly nitrogen fixing crop. 100 g green pods contain 1.7 g protein, 0.1 g fat, 4.5 g carbohydrate, 1.8 g fibre and are also rich in minerals and vitamins. It has some medicinal properties in control of diabetes, cardiac problems and natural cure for

bladder burn. It has both carminative and reparative properties against constipation and diarrhea as reported by Duke, 1981.

In India, it is mainly grown in Himachal Pradesh, Uttar Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. In India, pulses account for about one fifth of the total area under food grains and contribute to about one fifth of the total food grain production with the total area under pulses being 23.85 million ha and production of 14.60 metric tones (Anon., 2008). Among the pulses, raj mash is one of the high potential pulse crops with a yielding potential of 18 to 20 q per ha. French bean fetches premium price in market as compared to other vegetables and is a popular vegetable grown under irrigated conditions almost throughout the year. It is gaining lot of importance due to its short duration and high production potential as well as its high nutritive value. French bean is a tender warm season vegetable which cannot tolerate frost, high temperature and rainfall. Its seeds do not germinate below 15°C and a most favorable soil temperature for its seed germination ranged from 18-24°C. A mean air temperature of 20-25°C is optimum for its growth and high pod yield. Extreme high temperature interferes with pod filling. When sowing of French bean is done in September-October under open field conditions in Punjab there is a severe mortality of plants due to fusarium wilt at germination stage. Moreover occurrence of frost coupled with low temperature during the month of December-January causes mortality of plant. Hence extreme low and high temperature are the limiting factors for successful cultivation of French bean

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under open field conditions in Punjab.

To overcome these environment factor, protected cultivation particularly net-house cultivation is the best alternative which offers distinct advantages of earliness, high productivity, better quality and pesticide residue free produce besides higher returns to growers. Singh *et al* (2004) while studying the cultivation of capsicum in net-house reported that fruits are more uniform, larger in size and mature one month earlier to conventional cultivation. So, net-house cultivation of *capsicum*, tomato and brinjal in net-house has been recommended by Punjab Agricultural University, Ludhiana.

## MATERIAL AND METHOD

Twenty genotypes of French bean were collected from different sources (Public sector and private sector) were collected. These varieties were evaluated at Vegetable Research Farm, Department of Vegetable Crops, Punjab Agricultural University, Ludhiana from October to March in the net-house and in the open field conditions during the year 2008-09 and 2009-10. The experiment was laid out in a Randomized Complete Block Design with three replications. Genetically pure seeds of each genotype were sown in a 2.5 m long row at 30 cm spacing between paired rows on a 90 cm raised bed (45 cm bed top and 45 cm furrow). The plant to plant spacing was kept 10 cm and recommended cultural practices were followed to raise a uniform healthy crop. Pooled mean value of the parameters in each replication was statistically analysed. The table formulated by Fisher and Yates (1963) were consulted for the purpose of comparison of 'F' values and for determination of critical differences (C.D. values) at the probability of 0.05.

## RESULT AND DISCUSSION

### Days to 50% germination

The germination of the seed depicts the yield of the crop. The data presented in Table 1, showed that 50% germination of the seeds of different varieties took 10.00 to 13.00 days during 2008-09 and 9.00 to 14.00 days during 2009-10 recording non significant differences among various cultivars for germination. Likewise the pooled mean for 50% germination, the days taken were between 9.50 to 13.17 which also showed that all the cultivars were statistically at par for germination. The varieties which showed relatively higher germination percentage were Mohanpur Local (95.5) Badsah (92.45%), Arka Suvidha (86.53%), Shillong Local-3 (84.22%). Seedling root length measured at 9day of germination was highest for Shillong Local-3(14.83 cm) whereas it was obtained as lowest for Falguni (8.90 cm), (Das *et al*. 2014)

### Plant height (cm)

The present study revealed that among the various

genotypes (Table-1), it was noticed that most of the genotypes were shorter than the cultivar Contender except genotype 504-64C and FB-17 where average height of two years was 85.53 and 71.20 cm, respectively. It was further seen from the data that genotype 'Seville' was the most dwarf one in nature recording the height of 35.70 cm and 34.00 cm, respectively during 2008-09 and 2009-10. The plant of genotypes FB-6, Cosmo, DWP FB-57, IIHR-909 and Aperia were also shorter statured and were statistically at par among themselves where those recorded an average height of 42.27 cm, 45.00 cm, 46.67 cm, 48.00 cm and 47.07 cm respectively during 2008-09 and 40.33 cm, 45.00 cm, 44.67 cm, 43.33 cm and 43.67 cm during 2009-10. Rest of the cultivars recorded intermediate heights. These genotypes were DW FB-53, FB-4, Falguni, FB-16, DWP-FB-1, FB-18 where average height ranged between 50.00 cm to 59.70cm. The differential height of various genotypes is due to genetic constitution of various cultivars as a result of which the cultivars had variation in height. With respect to plant height the highest value was highest value was obtained in case of genotypes Badsah (47.53 cm ) and lowest for the genotypes Abhay (25.67 cm ), (Das *et al* 2014).

### Days to 50% flowering

Days to 50 % flowering are an index for earliness in any crop. The present study depicted the significant variation in 50% flowering during the first year of the study where it took between 51.00 days to 61.67 days during 2008-09, (Table 1 ). But during the year 2009-10 the non-significant differences were recorded among the various genotypes. It was noticed that during 2008-09, the cultivar 'Falguni' was the earliest to flower where it took 51.00 days as compared to 57.67 days in Contender. Likewise Falguni was the earliest to flower during 2009-10 also where Falguni flowered in 55.33 days while Contender took 60.00 days. It showed that Falguni was the earliest to flowering by 5-7 days than the check cultivar Contender. The data further showed that FB-17, DWP FB-53 and FB-3 were the most late cultivar to flower during both the years. However, rest of the genotypes was intermediary in their response to 50% flowering where it ranged between 52.67 days to 59.33 days during 2008-09. It shows that the selection among various genotypes can be done for earliness to flowering. However, narrow range in flowering is most probably due to the aerial temperature conducive for flower formation. Similar finding with respect to days taken to pod set from 50 % flowering in common bean has been reported by Kamaluddin and Shaahid- Ahmed (2011). Khyad (1996) reported minimum number of days to 50% flowering in 'Arka Komal' (33.83) and 'Burpee's Stringless' (34.00).

**Table 1.** Mean values of genotypes character days to 50% germination, plant height (cm) and days to 50% flowering

S. N.	Genotypes	Days to 50% germination			Plant height (cm)			Days to 50% flowering		
		2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean
1.	Falguni	10.00	11.67	10.83	55.73	54.00	54.87	51.00	55.33	53.17
2.	Seville	11.33	11.33	11.33	35.70	34.00	34.85	52.67	60.67	56.67
3.	Aperna	10.67	12.67	11.67	47.07	43.67	45.37	57.67	65.00	61.33
4.	504-64C	12.33	14.00	13.17	86.40	84.67	85.53	55.33	63.67	59.50
5.	Cosmo	11.00	12.67	11.83	45.00	44.00	44.50	60.67	64.00	62.33
6.	DPP-BSS-1	13.00	13.33	13.17	51.33	47.33	49.33	57.67	58.67	58.17
7.	DWP-FB-1	13.00	12.33	12.67	56.33	54.00	55.17	59.00	63.67	61.33
8.	DWP-FB-53	10.67	12.00	11.33	51.33	48.67	50.00	61.00	60.33	60.67
9.	DWP-FB-57	12.00	12.67	12.33	46.67	44.67	45.67	55.00	55.33	55.17
10.	IIHR-909	12.67	11.00	11.83	48.00	43.33	45.67	56.67	61.00	58.83
11.	FB-3	10.00	9.00	9.50	62.33	60.33	61.33	60.67	61.33	61.00
12.	FB-4	10.00	12.67	11.33	55.27	52.67	53.97	58.33	62.00	60.17
13.	FB-5	11.33	11.33	11.33	49.13	47.33	48.23	59.33	57.00	58.17
14.	FB-6	13.00	10.67	11.83	42.27	40.33	41.30	60.00	64.33	62.17
15.	FB-16	12.67	9.67	11.17	54.13	52.00	53.07	58.00	60.67	59.33
16.	FB-17	10.00	12.00	11.00	72.40	70.00	71.20	61.67	58.00	59.83
17.	FB-18	10.67	10.00	10.33	61.07	58.33	59.70	56.67	59.33	58.00
18.	FB-19	12.00	9.67	10.83	58.00	55.33	56.67	59.67	63.00	61.33
19.	FB-20	12.33	10.33	11.33	49.67	46.67	48.17	53.67	57.67	55.67
20.	Contender (C)	13.33	11.00	12.17	65.67	64.00	64.83	57.67	60.00	58.83
	Mean	11.60	11.50	11.55	54.67	52.27	53.47	57.62	60.55	59.08
	Range	10.00-13.00	9.00-14.00	9.50-13.17	35.70-86.40	34.00-84.67	34.85-85.53	51.00-61.67	55.33-65.00	53.17-62.33
	CD (5%)	NS	NS	1.88	6.47	5.94	4.32	5.81	NS	4.49
	CV	13.10	15.24	14.20	7.17	6.87	7.03	6.1	7.04	6.61

**Table 2.** Mean values of genotypes character, days to first harvest, number of pods per/ plant and average pod weight (g).

S. N.	Genotypes	Days to first harvest			Number of pods per/ plant			Average pod weight (g)		
		2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean
1.	Falguni	78.00	80.00	79.00	54.67	50.00	52.33	7.16	6.76	6.96
2.	Seville	84.33	82.00	83.17	53.00	48.66	50.83	4.53	4.26	4.39
3.	Aperna	89.33	88.00	88.67	40.00	44.66	42.33	5.76	5.66	5.71
4.	504-64C	92.67	90.33	91.50	44.00	40.66	42.33	5.16	5.00	5.08
5.	Cosmo	81.67	84.33	83.00	46.67	40.54	43.605	6.26	5.96	6.11
6.	DPP-BSS-1	87.67	84.00	85.83	48.00	21.88	34.94	4.86	4.50	4.68
7.	DWP-FB-1	86.33	83.67	85.00	27.33	16.33	21.83	4.16	4.33	4.24
8.	DWP-FB-53	88.67	79.00	83.83	35.00	35.67	35.34	4.10	3.90	4.00
9.	DWP-FB-57	82.00	80.00	81.00	38.00	38.00	38.00	5.90	5.66	5.78
10.	IIHR-909	77.00	78.00	77.50	50.67	48.33	49.50	5.20	5.00	5.10
11.	FB-3	84.33	84.67	84.50	33.33	34.00	33.67	4.50	4.30	4.4
12.	FB-4	87.67	86.33	87.00	36.00	36.67	36.34	4.60	4.33	4.46
13.	FB-5	84.67	82.67	83.67	35.33	33.67	34.50	4.10	3.86	3.98
14.	FB-6	91.67	89.33	90.50	37.33	36.33	36.83	4.56	4.36	4.46
15.	FB-16	84.00	82.00	83.00	31.00	32.67	31.84	4.16	3.90	4.03
16.	FB-17	87.67	78.00	82.83	30.33	31.33	30.83	4.60	4.33	4.46
17.	FB-18	82.33	80.67	81.50	34.33	35.00	34.67	4.33	4.10	4.21
18.	FB-19	85.67	83.33	84.50	35.00	33.67	34.34	4.26	4.06	4.16
19.	FB-20	83.33	78.00	80.67	32.00	33.00	32.50	3.76	3.56	3.66
20.	Contender (C)	82.00	84.67	83.33	37.33	40.33	38.83	4.90	4.63	4.76
	Mean	85.05	82.95	84	38.97	35.42	37.19	4.84	4.61	4.72
	Range	77.00-92.67	78.00-90.33	77.5-91.50	27.33-54.67	16.33-50.00	21.83-52.33	3.76-7.16	3.56-6.76	3.66-6.96
	CD (5%)	NS	NS	6.24	4.81	7.47	4.37	1.09	1.10	0.76
	CV	6.18	6.72	6.45	7.47	11.72	9.81	13.67	14.47	14.06

**Days to first harvest**

The data present in Table-2, revealed that various genotypes do not differ significantly for days to first picking during both the years of investigation, however on pooled mean basis it was noticed that among them, Falguni was the cultivar which took minimum days to reach the stage of first harvest.

Falguni took 79.00 days to give first harvest which was statistically at par with Contender (check) which gave first harvest in 83.33 days. Among rest of the cultivars, 504-64 C, FB-6 and FB-4 took maximum number of days to first picking. Being statistically at par among themselves those took 91.00, 90.50 and 87.00 days respectively. The rest of the cultivars

were at par with Contender for first picking where those counted between 77.50 days (IIHR-909) to 86.33 days (FB-4).

#### Number of pods per plant

The present study conducted in year 2008-09 and 2009-10 (Table-2) revealed that the number of pods per plant in 2008-09 varied from 27.33 – 54.67 among the various genotypes. Maximum number of pods was observed in genotype Falguni (54.67), which was statistically at par with genotypes Seville and IIHR-909 where numbers of pods were 53.00 and 50.67, respectively. Minimum number of pods were observed in genotypes DWP-FB-1 (27.33), FB-16 (31.00), FB-20 (32.00), Contender (37.33) and FB-18 (34). Number of pods per plant in 2009-10 varied from 16.33-50.00 among various genotypes. Maximum pods were observed in genotype Falguni (50.00), which was statistically at par with genotypes Seville, IIHR-909 and Aperia, where number of pods were 48.66, 48.33, 44.66, respectively. Minimum number of pods were harvested in genotypes DWP-FB-1 (16.33) and DPP BSS-1 (21.88). In the pooled data for two years the maximum pod number were observed in genotype Falguni (52.33) which was statistically at par with genotypes Seville (50.83) and IIHR-909 (49.50). Ram Krishna (1999) reported (11.10) and (10.23) number of pods per plant in Arka Komal and Burpee's stringless, respectively.

#### Average pod weight (g)

Average pod weight (Table-2) was observed during 2008-2009 ranged from 3.76-7.16 g. The maximum pod weight was observed in genotype Falguni (7.16 g) which was statistically at par with genotype Cosmo (6.26 g) followed by DWP-FB-57, Aperia, 504-64C where it was recorded (5.90g), (5.76g) and (5.16g), respectively. The minimum pod weight was observed in genotypes FB-20, FB-5, DWP-FB-53, FB-16 and DWP-FB-1, where it weighted (3.76g), (4.10 g), (4.10g), (4.16g) and (4.16g), respectively. During 2009-10 average pod weight was observed 3.56-6.76 g, the maximum pod weight was observed in genotype Falguni (6.76 g), which was statistically at par with genotypes Cosmo, Aperia and DWP-FB-57 where it weighted (5.96g), (5.66g) and (5.66g), respectively followed by IIHR-909 (5.00g) and Contender (4.63g). The minimum pod weight was observed in genotypes FB-20, FB-16, DWP-FB-53 and FB-18, where it weighted (3.56g), (3.90g), (3.90g) and (4.10 g), respectively. In the pooled data for two years, pod weight ranged from 3.66-6.96 g. There were significant differences in average pod weight per plant in different French bean genotypes. The maximum pod weight was observed in genotype Falguni (6.96g) followed by genotypes Cosmo, DWP-FB-57, Aperia, 504-64-C, where it weighted (6.11 g), (5.78g), (5.71g) and (5.08g), respectively. The minimum pod weight was observed in genotypes FB-20 (3.66g), FB-5 (3.98g), DWP-FB-

53 (4.00g), FB-16 (4.03g). Ram Krishna (1999) reported green pod weight of Arka Komal and Burpee's stringless as 31.12g and 29.82g, respectively.

#### Pod length (cm)

During 2008-09 (Table 3) the maximum pod length was observed in genotypes FB-4 (18.00 cm) which was statistically at par with genotypes Cosmo (17.00 cm) and FB-18 (15.33 cm). The minimum pod length was observed in genotypes FB-3 (9.67 cm), IIHR-909 (10.00 cm), DWP-FB-53 (10.00 cm), DWP-FB-57 (11.00 cm), FB-6 (11.33 cm) and Aperia (11.33 cm). During 2009-10, the maximum pod length was observed in FB-4 (17.00cm) which was statistically at par with Cosmo (14.33cm), FB-5 (14.00 cm) and check Contender (15.30cm). The minimum pod length was observed in genotypes DWP-FB-57 (9.33 cm), FB-3 (9.33 cm), DWP-FB-53 (9.67 cm), FB-6 (10.00 cm), Aperia (10.33 cm) and IIHR-909 (10.67 cm), respectively. In the pooled data for two years, there were a significant difference in pod length per plant in different French bean genotypes. It was observed that maximum pod length was observed in genotypes FB-4 (17.50 cm) which was statistically at par with genotypes Cosmo (15.67 cm) and minimum pod length was observed in genotypes FB-3 (9.50 cm), DWP-FB-57 (9.83 cm), DWP-FB-57 (10.17 cm) and IIHR-909 (10.33 cm). Ram Krishna (1999) reported green pod length 13.24 cm in 'Arka Komal' and 13.03 cm in 'Burpee's stringless'.

#### Pod width (cm)

The pod width (Table-3) of French bean recorded in 2008-09 varied from 0.69-1.08 cm. The maximum pod width was observed in genotype FB-3 (1.08cm) which was statistically at par with genotypes Falguni (1.04 cm), Seville (1.02 cm), FB-17 (0.98 cm), FB-19 (0.98 cm) and FB-20 (0.96 cm). Minimum pod width was observed in genotypes Aperia (0.69 cm), FB-5 (0.73 cm), DWP-FB-1 (0.75cm) and DWP-FB-53 (0.78 cm). During 2009-2010, pod width varied from 0.68-1.03 cm. The maximum pod width was observed in genotype FB-4 (1.03 cm) which was statistically at par with genotypes FB-3 (1.00 cm), Falguni (0.99 cm), Seville (0.98 cm), FB-20 (0.93 cm), FB-16 (0.93 cm), FB-16 (0.92 cm), FB-17 (0.92 cm) and FB-18 (0.90 cm). Minimum pod width was observed in genotypes Aperia (0.68 cm), DWP-FB-1 (0.70 cm), DWP-FB-53 (0.72 cm) and FB-5 (0.72 cm). In pooled mean for two years, there were significant differences of pod width in different French bean genotypes and it varied from 0.68 to 1.04 cm. Pods of genotype FB-3 and FB-4 had maximum pod width (1.04 cm) which was statistically at par with genotypes Seville (0.99 cm), FB-19 (0.97 cm), FB-19 (0.97 cm), FB-17 (0.95 cm), Contender (0.94 cm) and 504-64c (0.91 cm), respectively. Minimum pod width was observed in genotypes Aperia (0.68 cm), FB-5 (0.72 cm), DWP-FB-1 (0.73 cm) and DWP-FB-53 (0.75 cm). Roy and

Parthasarathy (1999) reported 0.78 cm green pod width in Tender Crop, 0.77 cm in stringless cluster, 0.78 cm in Canadian Wonder, 0.74 cm in Meghalaya

Pole, 0.77 cm in Maghalya Dwarf and 0.71 cm in Manipur.

**Table 4.** Mean values of genotypes for pod length (cm), pod width (cm) and green pod yield per plant (g)

S. No.	Genotypes	Pod length (cm)			Pod width (cm)			Green pod yield per plant (g)		
		2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean	2008-09	2009-10	Pooled mean
1.	Falguni	14.00	12.67	13.33	1.04	0.99	1.02	381.16	319.22	350.19
2.	Seville	13.33	12.00	12.67	1.00	0.98	0.99	208.60	185.50	197.05
3.	Aperna	11.33	10.33	10.83	0.69	0.68	0.68	200.67	233.37	217.02
4.	504-64C	12.67	11.00	11.83	0.93	0.89	0.91	194.67	181.00	187.84
5.	Cosmo	17.00	14.33	15.67	0.93	0.88	0.90	373.11	286.60	329.86
6.	DPP-BSS-1	11.67	13.00	12.33	0.91	0.86	0.89	203.60	186.00	194.80
7.	DWP-FB-1	13.00	11.33	12.17	0.75	0.70	0.73	115.10	97.80	106.45
8.	DWP-FB-53	10.00	9.67	9.83	0.78	0.72	0.75	143.50	140.30	141.90
9.	DWP-FB-57	11.00	9.33	10.17	0.91	0.84	0.87	225.53	218.00	221.77
10.	IIHR-909	10.00	10.67	10.33	0.80	0.85	0.83	234.10	246.33	240.22
11.	FB-3	9.67	9.33	9.50	1.08	1.00	1.04	151.23	144.33	147.78
12.	FB-4	18.00	17.00	17.50	1.05	1.03	1.04	165.60	158.00	161.80
13.	FB-5	12.67	14.00	13.33	0.73	0.72	0.72	144.93	131.80	138.37
14.	FB-6	11.33	10.00	10.67	0.80	0.79	0.79	170.90	160.56	165.73
15.	FB-16	12.67	11.33	12.00	1.01	0.93	0.97	129.03	129.30	129.17
16.	FB-17	12.33	10.67	11.50	0.98	0.92	0.95	140.83	139.50	140.17
17.	FB-18	15.33	13.33	14.33	0.91	0.90	0.90	150.13	147.20	148.67
18.	FB-19	13.67	11.67	12.67	0.98	0.95	0.97	148.40	133.13	140.77
19.	FB-20	14.67	13.00	13.83	0.96	0.93	0.95	121.23	120.70	120.97
20.	Contender (C)	14.5	15.30	14.90	0.96	0.93	0.94	183.90	182.90	183.40
	Mean	13.10	12.05	12.57	0.91	0.87	0.89	189.31	177.08	183.19
	Range	9.67 – 17.00	9.33 – 17.00	9.50 – 17.50	0.69 – 1.08	0.68 – 1.00	0.68 – 1.04	115.10 – 381.16	97.8 – 319.22	106.45 – 350.19
	CD (5%)	3.14	3.05	2.15	0.12	0.13	0.92	44.85	62.29	37.96
	CV	14.51	15.34	14.91	8.07	9.45	8.76	14.33	21.05	18.02

### Green pod yield per plant (g)

Green pod yield (Table-3 ) in 2008-09 varied from 115.10 - 381.16 g per plant so lot of variation was present among the studied genotypes. Falguni yielded all the genotypes for green pod yield per plant where it showed a yield record of 381.16 g per plant, which was statistically at par with genotype Cosmo (373.11g) per plant. Other high yielding genotypes were DWP-FB-57 (225.53 g), Seville (208.60 g) and DPP-BSS-1 (203.60g) per plant. The lowest yield was recorded from DWP-FB-1, FB-20, FB-16 and FB-5, which yielded 115.10, 121.23, 129.03 and 144.93 g per plant, respectively.

During 2009-10, green pod yield varied from 97.8-319.22 g per plant, the maximum pod yield was observed in genotypes Falguni (319.22 g) per plant which was statistically at par with genotype Cosmo (286.60 g) per plant. Other high yielding genotypes were IIHR-909 (246.33g ), Aperna (233.37g) and DWP-FB-57( 218.00g) per plant. The lowest yield was recorded in genotypes DWP-FB-1 (97.80 g), FB-20 (120.70 g), FB-16(129.30 g) and FB-5(131.80 g) per plant. In pooled data for two years, green pod yield varied from 106.45 to 350.19 g per plant and there were significant differences in green pod yield per plant in different French bean genotype. Falguni out yielded in all the genotypes as it showed a yield record of 350.19 g per plant, which was statistically at par with genotype Cosmo (329.86g) per plant followed by other high yielding genotypes viz. IIHR – 909 (240.22 g ), DWP-FB-57 (221.77 g)

and Aperna (217.02 g) per plant. The lowest yield was recorded from plants of DWP-FB-1 which yielded only (106.45 g) per plant followed by FB-20, FB-16, FB-5, FB-17, FB-19, and DWP-FB-53 which yielded 120.97, 129.17, 138.37, 140.17, 140.77 and 141.90 g per plant, however, all these were at par with each other. Ramakrishna (1999) reported green pod yield as 22.09 q/ac and 17.07 q/ac of two genotypes Arka Komal and Burpee's stringless, respectively.

### CONCLUSION

The analysis of variance revealed that all the genotypes were significantly different in treatments for all the characters in 2008-09 and 2009-10. Twenty genotypes of French bean were evaluated along with the variety Contender (check) for nineteen characters. On the basis of pooled mean, Falguni and Cosmo out yielded all the genotypes in the net –house. These genotypes yielded more due to more number of pods per plant, pod length, pod width and pod weight. Maximum average pod weight was found in Falguni and Cosmo and more number of pods were found in Falguni, Seville and IIHR-909. Pod length was maximum in FB-4 followed by Cosmo and Contender where as pod width was maximum in FB-3 and Falguni. IIHR-909 and Falguni took minimum number of days to first harvest as compared to other genotypes and maximum numbers of pods were recorded in

Falguni, Seville and IHR-909 where as average pod weight was maximum in Falguni and Cosmo. On basis of pod shape and colour Falguni, Cosmo, Seville and IHR-909 were found best having round, straight and dark green/green coloured pods as compared to other genotypes.

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