



Swarna Gaurav: High yielding nutritionally rich faba bean variety

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ABSTRACT

Swarna Gaurav a faba bean variety recently developed by ICAR Research complex for Eastern Region Patna and has been recommended by Bihar State Varietal Release Committee (SVRC) for released its cultivation in the Bihar state. Developed variety i.e. "Swarna Gaurav" was nutritionally superior over existing cultivar and national check as well as containing very less amount of anti-nutritional factor like *tannin* and *phytate*; a major hurdle in the cultivation of such an excellent crop.

Keywords: Anti nutritional factor, Faba bean, High yielding variety, Phytate, Tannin

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INTRODUCTION

Faba bean (*Vicia faba* L.) is worldwide an important legume crop for rainfed as well as irrigated ecology. It is an annual legume crops grown for protein & fodder, and nitrogen fixer from atmosphere (lan and Geren, 2007). Faba bean is widely cultivated and ranked it the fourth most important legume crop in the world next to dry beans, dry peas and chickpea (Singh et al., 2014). It is grown as *Rabi* crop in diverse agro-ecological situations from hills to plain and even under poor management. In India it is grown in a sizeable acreage in Bihar, Madhya Pradesh and some part of Utter Pradesh (Singh et al., 2012a). Its green pods are used as vegetable and dry seeds are use as split dal and the preparation of besan. It is popularly called as "Bakla" in Hindi heartland (Singh et al., 2013). Seeds of faba bean greatly varied in size, shape, specific gravity, bulk density etc. (Bora et al., 1998 and Sundaram et al., 2014). Its critical role in crop rotation, reducing energy cost, improving soil physical conditions and decreasing the amount of diseases and weed populations has long been recognized (Singh et al., 2012a). In spite of its potential, the total area of faba bean cultivation has steadily decreased in many countries over the last century (Singh et al., 2013b and Verma et al., 2015). Faba bean, like other beans, are a good source

of calories, protein, carbohydrates, and fibre they are also rich in phosphorus, iron, potassium, and vitamin B complex (Singh et al., 2014).

To make faba bean into a perfect candidate for a sustainable agriculture, the crop should be beneficial both to farmers/producers and to users (human and/or animal nutrition), there is need to development of high yielding nutritionally rich and free of anti-nutritional factors like *tannin* and *phytate* genotypes along with resistant to diseases and abiotic constrains such as over-wintering ability, frost resistance and drought avoidance, and free of anti-nutritional factors (Singh, et al., 2013). Lack of suitable varietal technology is one of the major bottlenecks to adopt this crop (Verma et al., 2015). Keeping in view, the above fact, ICAR Research complex for Eastern Region Patna become first ever institute to developed first faba bean varieties in the Bihar. The work on faba bean was started in the 2006. The developed variety was tested across the agroclimatic zone of Bihar as well under different cropping system for three years before its release for commercial cultivation in the state.

MATERIALS AND METHODS

The systematic research work on faba bean was started in the 2006. The developed variety was tested across the agroclimatic zone of Bihar as well under different cropping system for three years before its release for

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commercial cultivation in the state (Singh, 2015). Swarna Gaurav was developed by adopting selection method due to its added advantage of adaptability of screened and developed variety (Singh *et al.*, 2012b and Singh, 2015). Plant selection method is one of the best and simple methods of crop improvement (Bond, 1966). Single plant selection was adopted for further screening and fixing of desired trait. Selection was made from the germplasm collected from Bihar (Singh *et al.*, 2012b and Verma *et al.*, 2015). To make it uniform standard package of practices were layout at ICAR Research Complex for Eastern Region Patna in simple Randomized Block Design replicated thrice, the plot size should not be not less than 12 square meters. Furrow irrigation and raised bed planting (FIRB) is the best management practices to optimized resources utilization. Square planting (keeping 30 cm apart) was recommended for both lines for better utilization of all the resources (Singh, *et al.*, 2013).

RESULTS AND DISCUSSION

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Since considerable area in Bihar is still under assured irrigation and intercropping is one of the main practices with potato, winter maize, lentil etc. Hence keeping in view the importance of intercropping “Swarna Gaurav” was developed for the assured irrigation and intercropping situation. Since faba bean has sown synergistic effects on companion crops, along with adding some nitrogen being a legume crop (Singh *et al.*, 2012b). The varietal evaluation trial was conducted across the state during 2011-11 to 2013-14. Under Bihar agro-climatic condition it’s realised its potential and overall average productivity was recorded 4.0 to 5.0

t/ha and 2.0 to 2.6 t/ha under sole and intercropping system. It recorded 36 % advantage over the test check variety *i.e.* Vikrant (Table 1).

Table 1: Multi location evaluation of developed lines of faba bean

Location of Evaluation	Performance of faba bean (Seed yield t/ha)	
	Swarna Gaurav	*Vikrant
ICAR, Patna	5.38	2.36
ICAR, Ranchi	3.1.8	2.19
IARI,RS, Pusa	5.88	2.51
WALMI, Patna	5.18	2.74
CPRS, Patna	4.58	2.57
KVK Auraiya	4.23	2.28
KVK, Sitamarhi	3.82	1.96
KVK, Buxar	3.89	1.14
Average	4.71	2.22
CD p=(0.05)	0.37	

*Check variety; Irrigation (2 nos.) has been provided need based *i.e.* (watering at pre flowering and post podding)

Data pertaining to Premium Attributes of Swarna Gaurav is presented table 2. Results accord that the developed faba bean variety Swarna Gaurav produces 8-10 branches per plant (Fig.1a). It takes approximately 59-64 days to come in to anthesis. Its bear 80-90 pods/plant.1000- Seeds weight (g) is 281.80 and Seed coat colour is pale brown to light brown (Table 2). Length of pod is 4.0 -4.5 cm. This variety is moderately resistant to major insect pest and diseases (Fig.2).

Table 2: Premium Attributes of Swarna Gaurav

Attributes	Swarna Gaurav	#Vikrant
Branches per plant	8.0-10	6-8
Days to anthesis	59-64 days after sowing	62-71 days after sowing
Pod -Shape	Long	Long
Pod -Colour	Green	Green
Pod -Length	4.0-4.5cm	3.0-4.0cm
Seeds/pod	3-4	3-4
Pod/plant	80-90	54-78
1000- Seeds weight (g)	281.80	239.40
Seed coat colour	Pale brown to light brown	Pale brown to light brown
Seed shape	Spherical in shape with 78.% sphericity	Spherical in shape with 83.03 sphericity
Cotyledon color	Light to pale yellow in colour	Light to pale yellow in colour

Check Variety



Fig.1 a: Plant type of newly developed faba bean variety Swarna Gaurav

Data presented in [table 3](#) revealed about the Salient features of Swarna Gaurav. This variety attains height of 77- 105 cm, plant type is bushy. It is a medium duration cultivar matures in 120-125 days, whereas the check variety takes 130-140 days. It starts bearing pod at the height of 7.5 cm from the base. The first picking of green pod can be done after 90-95 days after sowing. The seed yield potential of this variety is 5.0 to 5.5 t/ ha ([Table 3](#)).

Table 3: Salient features of Swarna Gaurav

Attributes	Swarna Gaurav	#Vikrant
Plant height	77- 105 cm	65-95
Days to maturity	120-125	130-140
Yield potential (t/ha)	5.0 to 5.5	2.5-3.2
Harvest Index (HI)	0.63	0.51
Leaf Area Index (90DAS)	2.14	1.89
Plant type	Bushy	Semi busy
1stpodding height	7.5 cm	10.5 cm
Recommended for	Irrigated condition	Irrigated condition

Check Variety

Nutritional composition of Swarna Gaurav has been done and data is depicted in [table 4](#). This cultivar contains significantly higher (13.49%) dietary fiber and 31.12% protein. The major breakthrough is the staggering low content of ant-nutritional factor tannin and phytate. Both factor were significantly lower than the check variety *i.e.* Vikrant ([Table 4](#)).The sweetness of



Fig.2: Field view of newly developed faba bean variety Swarna Gaurav

the mature seeds is 10.34 TSS. The developed variety is also rich in minerals like iron, manganese and zinc as compare to check variety vikrant ([Table 4](#)). Not only has these it also contained very good amount minerals particular phosphorus (0.154%) and iron (2420mg/kg) [Singh et al., 2014](#).

Table 4: Nutritional composition of Swarna Gaurav

Parameters	Swarna Gaurav	#Vikrant
Fat (%)	1.54	1.58
Protein (%)	31.12	30.51
Dietary Fiber (%)	13.49	11.94
Tannins as Tannic acid %	0.88	1.12
Phytate (%)	0.07	0.64
Total carbohydrate (%)	49.72	53.58
Total soluble sugar (%)	10.34	9.53
Total starch (%)	44.16	36.25
Phosphorus (%)	0.154	0.046
Iron (mg/kg)	2420.0	2124.1
Manganese (mg/kg)	11.40	11.45
Copper (mg/kg)	15.10	15.08
Zinc (mg/kg)	50.20	51.67

Source: [Singh et al., 2014](#).

Data were also recorded about physical parameters of seed of Swarna Gaurav and presented in [table 5](#). It was noticed that the length of seeds (mm) 8.47 ± 0.50 , width (mm) 6.30 ± 0.36 and thickness (mm) 5.51 ± 0.33 . Data confirm that the seed also differ with respect to pphysical parameters taken under study ([table 5](#) and [Fig.1b](#)) [Sundaram et al., 2014](#).



Fig.1b: Seeds of newly developed faba bean variety Swarna Gaurav

Table 5: Physical parameters of seed of Swarna Gaurav (at moisture contents of 10.10%)

Particulars	Swarna Gaurav	# Vikrant
Length (mm)	8.47±0.50	7.93±0.65
Width (mm)	6.30±0.36	6.26±0.32
Thickness (mm)	5.51±0.33	5.71±0.33
Geometric Mean Diameter (mm)	6.64±0.33	6.57±0.33
Sphericity	78.55±2.55	83.03±4.42
Bulk density (g/cm ³)	0.918±0.014	0.88±0.002
True density (g/cm ³)	1.336±0.011	1.287±0.017
Porosity (%)	31.264±1.43	31.49±1.05
Angle of repose (degree)	22.86±1.31	21.29±0.74

Source: Sundaram *et al.*, 2014.

Good agronomic management practices (GAMP)

Square planting (keeping 30 cm apart) is advocated for both lines for better utilization of all the resources. Furrow irrigation and raised bed planting (FIRB) is the best management practices to optimized resources utilization. Both the developed lines are very much responsive to added nutrients. To produce faba bean seed @ 5.0 t/h, under sandy loam to clay loam soil condition with normal pH and medium soil fertility status, on an average, it requires N: P: K: S: Zn @ 25:60:40:30:5 kg/ha. It is essential to applied all nutrients as basal application,

however for better yield and quality. Topdressing of urea at pre-flowering stage after light irrigation may be done. Further foliar application of Zn @ 0.5 per cent and boron 50 ppm will make sure the productivity (Singh, *et al.*, 2012a).

CONCLUSION

Swarna Gaurav is high yielding, nutritionally superior containing very less amount of anti-nutritional factor like *tannin* and *phytate*; and recommended for release for its cultivation in the across the state covering all agro-climatic zones.

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