

'VL Bhat 201' soybean

a high-yielding nutrition rich black variety

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A recently developed and notified black-seeded soybean (Glycine max) variety 'VL Bhat 201' was recommended for commercial cultivation under rainfed organic conditions of Uttarakhand hills. It has yield potential of 1,642 kg/ha and showed significant yield advantage of 55.2% over black-seeded soybean (Bhat) check 'VL Soya 65' Soybean (1,058 kg/ha) under organic mode in Uttarakhand hills.

Key words: Black soybean, High-yielding, Nutrition, VL Bhat variety, Yield

BLACK soybean is black-seed coat colour variant of the cultivated soybean and is cultivated for food, folklore medicine and fodder by hilly and tribal communities in Asia particularly in China, Japan, Korea, Indonesia and India. The area under this valuable legume is confined to the north Himalayan hills region where it is grown as major *kharif* legume as well as in scattered pockets of central India where its cultivation declined drastically after soy-revolution gained momentum in India. Black soybean known as *Bhat/Bhatmash* in Uttarakhand hills and fondly consumed by local populace in various forms such as roasted whole grains, *chutney* and *dal*/gravies and

integral part of ethno-dietary recipes. It is grown in 6.5 thousand ha area with annual production of about 5.2 thousand tonne (2014-15) but the trend of the productivity levels are not much encouraging (Fig.1.) and vast scope exists to increase the productivity per unit area of this legume. Its cultivation is less capital intensive in nature and its ability to survive under harsh conditions particularly, in the event of failure of rain makes it a better choice than other competitive crops grown during rainy season in hills. This legume is well accustomed in the cropping system, food habits and rituals of hills region and is generally grown as mixed crop with finger millet as base crop. High nutritional

value and health promoting effects due to presence of various bioactive compounds make this legume as an excellent functional food crop and its consumption imparts various remedial benefits due to presence of plentiful amounts of natural pigment anthocyanin and flavonoid isoflavones in its seed coat and cotyledons respectively. This nutritious legume serves as food for human beings and feed for animals besides improving soil fertility by symbiotic nitrogen-fixation.

Black-seeded variety of soybean 'VL Bhat 201', developed by Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora for timely sown rainfed conditions in Uttarakhand hills. This elite black-seeded variety of soybean was developed through selection from local germplasm VHC3071 of Uttarakhand hills. Black-seeded soybean play a vital role in the nutritional security of rural and poor masses but traditional cultivars of this legume grown in hills are indeterminate in growth habit, tall, twining nature, purple flower with smaller seed size. It is sown in last week of June which flowers in mid-August to mid-September and harvested in mid-or late October. In

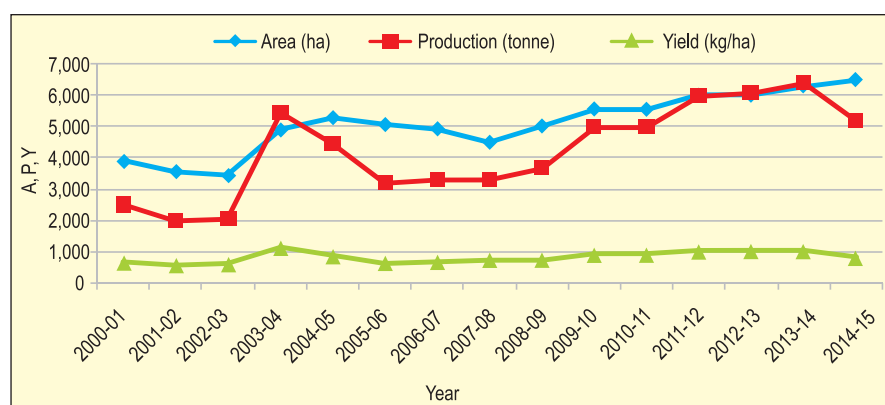


Fig.1. Present position of black soybean (VL Bhat 201) cultivation in Uttarakhand hills

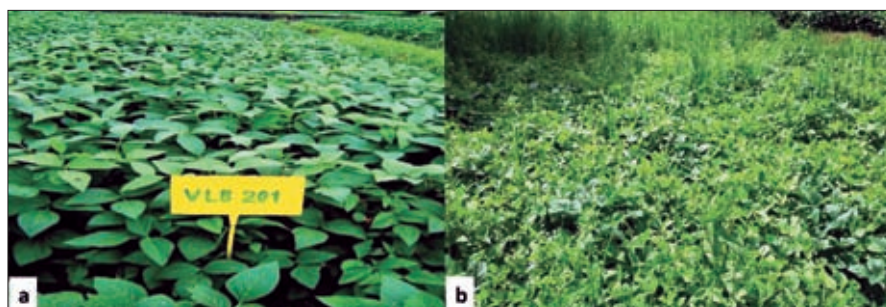


Fig. 2. (a) Black soybean variety 'VL Bhat 201' and (b) Traditional Bhat cultivar as mixed crop with finger millet at farmers' field

Table 1. Yield performance (kg/ha) of VL Bhat 201 soybean under State Varietal Trial during kharif 2010 to 2012

Year of testing (Locations)	Proposed entry VL Bhat 201 soybean	Checks	
		VL Soya 65	PS 1092 soybean
2010 (4)	1,406	719	958
2011 (3)	1,822	1,421	1,693
2012 (2)	1,842	1,193	931
Weighted Mean	1,642	1,058	1,197
Superiority over check (%)	-	55.20	37.18

Table 2. Agronomic performance of VL Bhat 201 under inorganic and organic conditions during Kharif 2012

Varieties of soybean	Yield (kg/ha)	
	Inorganic (20:80:40 kg/ha NPK)	Organic (FYM @ 5 tonne/ha dry weight basis)
VLB 201	1,881	1,979
VLS 63	2,317	2,268
VL Soya 65	1,367	1,494
Increase (%) over VL Soya 65	37.60	32.46

FYM, Farmyard manure

Table 3. Comparative quality parameters of VL Bhat 201 with black and yellow soybean varieties

Parameter	VLB 201	VL Soya 65	PS 1092
Protein (%)	41.02	38.76	37.13
Oil (%)	15.45	10.95	-
Water uptake (ml/10g)	6.83	8.16	8.33
Volume expansion ratio (ml)	14.75	9.90	9.25
Hardness after fixed time of cooking (Kg)	0.538.576	0.520	
Total polyphenols (mg/100g)	4.03	3.96	2.28

the prevailing cropping system, local black-soybean (*Bhat*) is grown with finger millet/*Mandua* (*Elusine coracana*) as the base crop (Fig.2) because viney and indeterminate plant type of traditional *Bhat* cultivar are lodging prone and always need a support to grow properly, avoid rotting of stem, leaves and pods of black soybean due to rains. Realizing importance of black soybean traditional farming system and cuisine the need was felt to develop high-yielding, frog eye leaf spot resistant and determinate plant type in black soybean. A germplasm

evaluation and characterization trial was conducted during kharif 2008, and individual plants from accession, namely VHC 3071 was selected and bulked based on similarities in morphological traits viz., plant height, plant type and resistance against frog eye leaf spot disease and tested in station trial during 2009 and subsequently, nominated to State Varietal Trial in 2010. It exhibited an average yield of 1,642 kg/ha and showed significant yield advantage of 55.2% over black-seeded soybean (*Bhat*) check VL Soya 65 (1,058 kg/ha) in three years of testing under

organic mode (Table 1). In All India Coordinated Research Project on Soybean, multi-location trial (IVT) during kharif 2011, VL Bhat 201 soybean exhibited yield potential of 2,120 kg/ha in northern hill zone comprising locations Almora and Majhera in Uttarakhand, Palampur and Bajaura in Himachal Pradesh. It was also tested at farmers' field trial conducted by Department of Agriculture, Dehradun, Uttarakhand during kharif 2013 where it recorded average yield potential of 2,700 kg/ha. In the agronomic trials, 'VL Bhat 201' soybean (1,818 kg/ha) has out yielded check 'VL Soya 65' (1,367 kg/ha) at recommended dose of inorganic fertilizer (20:80:20 kg/ha) by 37.6% and similarly, 'VL Bhat 201' (1,979 kg/ha) has out yielded check 'VL Soya 65' (1,494 kg/ha) by 32.5% under organic mode. However, 'VL Bhat 201' was found better under organic (1,979 kg/ha) conditions than inorganic (1,818 kg/ha) condition in yield levels (Table 2). This variety is nutritionally rich as it has 41.02% protein and 15.45% oil content in its seed as compared to 38.76% protein and 10.95% oil in check 'VL Soya 65'. Additionally, more radical scavengers/antioxidants in grain was found in 'VL Bhat 201' due to the presence of higher amount of total polyphenols (4.03 mg/100 g) resulting in better quality (Table 3). 'VL Bhat 201' has determinate, non-lodging plant type and attains average plant height of 69 cm with 117 days maturity duration. This variety has moderate grain weight (13.12 g/100 seed) compared to 'VL Soya 65' (17.74 g/100 seed) and generally, small flat seeded *Bhat* is preferred for local cuisine in Uttarakhand hills (Fig. 3). Seeing the aberrant climatic conditions during recent past, this variety will be suitable for alternative/ contingent crop planning. It was released and notified in November, 2016. Black-seeded soybean variety 'VL Bhat 201' has determinate growth habit, white flowers, tawny pubescence, pointed ovate leaves as well as good pod bearing of 60 to 65 pods/plant. Frog eye leaf spot disease problem is major concern in black soybean in hills which starts appearing at flowering

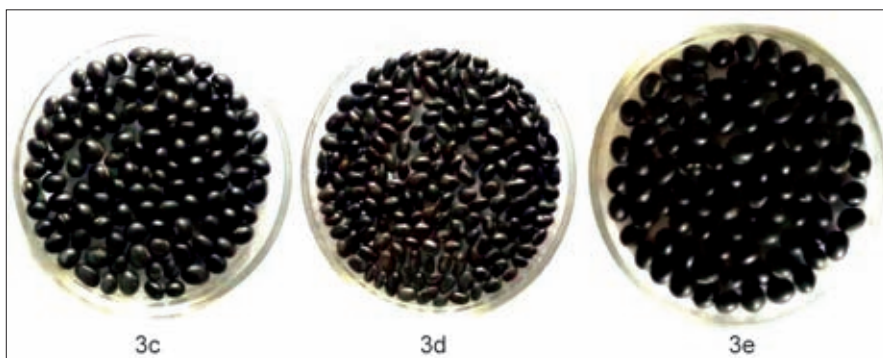


Fig. 3. Comparison of seed size (c) Black Soybean variety VL *Bhat* 201 (d) Traditional *Bhat* cultivar and (e) VL Soya 65

and causes approximately 35-40% reduction in yield levels in the region. The newly developed genotype 'VL *Bhat* 201' soybean possess high resistance against frog eye leaf spot (11.1%), target leaf spot (0.0%) and moderately resistant against pod blight (24.4%), the important diseases of black soybean (*Bhat*) in the hills besides, it has resistance against girdle beetle, aphids with moderate resistance to stem fly. Therefore, 'VL *Bhat* 201' soybean

will be a potential alternative for traditional poor yielding, disease prone black soybean cultivars to realize higher yield levels of black soybean in hills.

SUMMARY

Black soybean (*Bhat*) is an major traditional legume of Uttarakhand hills which fondly consumed as pulse in contrary to oilseed yellow soybean. It plays a vital role in the nutritional and livelihood security of resource

poor rural and tribal population of the region and accounts a sizable acreage in this region but stagnant productivity levels has resulted into unprofitability in cultivation and great neglectance of this valuable crop. Recently released variety of black soybean 'VL *Bhat* 201' is promising in its yield potential (1,642 kg/ha) as compared to traditional poor plant type and low yielding cultivars as well as it has high innate resistance against prevalent diseases and insect pest of black soybean in hills besides, excellent nutritional quality. Furthermore, secondary agriculture and utilization of this legume as nutraceutical/functional food is need be encouraged to realise its real commercial potential for income generation in the region.

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Artificial Intelligence and Internet of Things Applications in Agriculture

A special programme on, 'National Dialogue on Artificial Intelligence (AI) and Internet of Things (IoT) Applications in Agriculture' was held during June 1-2, 2018 at National Academy of Agricultural Research Management (NAARM), Hyderabad.



The purpose was to sensitize the participants about the enormous potential of data/ knowledge management, AI and IoT in the area of agriculture and allied sectors, and prepare base paper for next higher-level policy workshop.

About 30 participants from 20 ICAR institutes from all over India participated and contributed in the dialogue. The programme has been designed to cope with the challenges faced by the agriculture sector due to involvement of variety of stakeholders such as scientists, farmers, extension functionaries, inputs suppliers etc.

The programme consists of presentations by the experts and parallel group discussions etc., the topic includes 'AI in agriculture includes various tools like Agricultural Robots, Crop, Soil Monitoring and Predictive Analytics' & 'IoT includes methods like Precision Farming, Agricultural Drones, Livestock Monitoring and Smart Greenhouses'.

This is followed with Group discussion with the following theme such as 'AI and IoT applications in Crops', 'AI and IoT Applications in Natural Resource Management' and 'AI and IoT applications in Animal Science and Fisheries' and the recommendations emerging out of group discussion will be input for the strategic policy initiatives from the ICAR.