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Evaluation of Bio-effectiveness of SABUJ GOLD as Organic Manure on Chilli, Broccoli and French Bean

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ABSTRACT

The present study was carried out at the Instructional Farm, Faculty of Horticulture of Uttar Banga Krishi Vishwavidyalaya, Pundibari, Cooch Behar during *rabi* season of 2017 - 2018. The experiment trial was on the organic manure as well as plant nutrient supplement product "Sabuj Gold" on different growth, yield and quality related traits of three major rabi season crops namely chilli, broccoli and french bean. Result showed that all the growth, yield and quality parameters were improved significantly. Maximum plant height was 63.91cm (Chilli), 52.86cm (Broccoli) and 55.24cm (French bean), the highest fruit yield per hectare was 18.74 tonnes (Chilli), 7.21 tonnes (Broccoli) and 8.94 tonnes (French bean) per ha, the highest ascorbic acid content was 47.85mg/100g and ß carotene content was 1.37 mg/100g (Broccoli) recorded with the application of Sabuj gold as organic manure.

Key words : Broccoli, Chilli, French bean, Growth, Organic manure, Quality, Sabuj gold, Yield.

Introduction :

India is mainly known for its agricultural productivity (Sasikala *et al.*, 2016). Organic farming is practiced in India for thousands of years. The great Indian civilization thrived on organic farming and was one of the most prosperous countries in the world until the British ruled it. Green revolution in the post-independence era has shown the path for self-sufficiency in food but sustaining agricultural production against the finite natural resource base demands has shifted from the "resource degrading" chemical agriculture to a "resource protective" biological or organic agriculture. Although chemical fertilizers

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contribute a lot in fulfilling the nutrient requirement of crops, their regular, excessive, and unbalanced use leads to health and ecological hazards, deterioration of Physico-chemical properties of the soil, and ultimately to poor crop yields (Sharma and Thakur, 2002). The use of agrochemicals coupled with the degradation of cultivable land and increasing agricultural pollution has created an unhealthy situation in the country. Rainfall and excessive use of irrigation water cause alkalinity or acidity of the soils. Many scientists at different levels have elaborated on the concept of organic farming as, "A system that is designed and mailed to produce to agricultural products by the use of methods, and substances that maintain the integrity of organic agricultural products until they reach the consumer".

Materials and methods :

Present experiment was conducted during the*rabi* season of the year 2017-18 to evaluate the bio-effectiveness of SABUJ GOLD as organic manure on chilli, broccoli, and french bean at the Horticulture Instructional Farm, Uttar Banga Krishi Viswavidyalaya (U.B.K.V.), Pundibari, Coochbehar which isgeographically located at Terai agro climatic zone of West Bengal situated at 26°19'86" N latitude and 89° 23'53" E longitude at an elevation of 43 meter above mean sea level having sandy loam textured soil with poor water holding capacity and moderate fertility status with slightly acidic pH. For the experiment Chilli *var.* SVHA2222 (Seminis), Broccoli *var.* Green Magic (Sakata) and French bean *var.* Falguni (Seminis) were selected as study materials and collected from local market. In the present experiment SABUJ GOLD was considered as organic supplement and it is dark brown colour enriched processed complex organic manure with neutral pH level, having high macro/micronutrient value, applied at the rate of 300 kg per acre of land one month before sowing by mixing thoroughly in the soil. All the three cropswereraised separately in Randomized Block Design with fourreplications under four major treatments *viz.,* T_1 : 100% Organic manure + full Organic certified inputs (plant protection measures). T_2 : 100% Organic manure + full inorganic supplement (plant protection measures), T_3 : 100% Inorganic practice, T_4 : Nil organic or inorganic supplements.

For documentation of performance sample were collected from four randomly selected healthy each replication and sample were homogenized well for record keeping and analysis. Observations were recorded for growth and yield parameters *viz.,* Days to germination, Germination percentage (emergence) (%), Seedling height (cm), Plant height (cm), Days to first flowering, Number of primary branches, Fruit length (cm), Fruit diameter(cm), Pericarp thickness (mm), Fruit weight (g), Number of fruits per plant, Yield per ha (t/ha) in chilli; Number of leaves, Leaf length (cm), Leaf width (cm), Head initiation (days), Head circumference (cm), Head weight (cm) in broccoli; Pod length (cm), Pod width (mm) and Pod diameter (mm), Pod per plant in French bean. Qualitative observations were recorded on Chlorophyll

A, B and total chlorophyll of leaf and Ascorbic acid content in ripe fruit (as per Sadasivam and Manickam, 1996); â-carotene of ripe fruits (Davies, 1976); total soluble solids in ripe fruits (Dubois *et al.,* 1956) in milligrames per 100 grames of sample through spectrophotometric method. Mean data were processed following Duncan's multiple range test by using SPSS program version 17 to compare the mean values among the treatment. The details of the materials used and methods adopted during an investigation are discussed hereunder.

Results and discussion :

***Chilli* :**

Table 1 revealed that treatment 1 showed minimum values for the characters *viz.,* number of days taken from sowing to germination (12.92 days) and the number of days taken from transplanting to first flower appearance (41.23 days) was minimum (*i.e.,* earliness) followed by treatment T_2 (*i.e.,* 12.94 and 42.36 days, respectively). Germination percentage was highest in treatment with inorganic inputs (80.36%) followed by treatment 2 (79.22) and thereby indicated the importance of nutrient in enhancement of germination.

Treatment T_1 showed significant increasedin height of 8.92cm after 20 days of germination (i.e., very vigorous growth) followed by treatment 2 (8.77cm) and very less vigor recorded in treatment with no organic/inorganic input (8.02cm). For the attributes like plant height of 64.29 cm, number of primary branches per plant of 9.37, fruit weight of 3.12g the treatment with 100% Organic manure + full other inorganic supplement (plant protection measures) showed maximum values followed by 100% Organic manure + full other Organic certified inputs (plant protection measures) (*i.e.,* 663.91 cm, 9.13 and 3.01 g, respectively). Treatment 1 showed the highest significant positive values for characters like fruit length (12.68 cm), fruit diameter (2.34 cm), pericarp thickness (0.79 mm), number of fruits per plant (161.45), yield per hectare (14.72 tons), chlorophyll A (298.71mg/100 g), chlorophyll B (122.34 mg/100 g) and total chlorophyll content(421.05 mg/100 g) of leaf followed by treatment 2 *viz.,* fruit length (12.61 cm), fruit diameter (2.31 cm), pericarp thickness (0.68 mm), number of fruits per plant (157.96), yield per hectare (14.41 tons), chlorophyll A (287.96 mg/100 g), chlorophyll B (115.71 mg/100 g) and total chlorophyll content (403.67 mg/100g) of the leaf. Minimum values were shown by the treatment without organic/inorganic aids like fruit length (10.54 cm), fruit diameter (2.12 cm), pericarp thickness (0.54 mm), number of fruits per plant (117.34), yield per hectare (10.69 tons), chlorophyll A (266.21 mg/100 g), chlorophyll B (106.72 mg/100 g) and total chlorophyllcontent (372.93 mg/100 g) of the leaf.

Table 1 : Different quantitative and qualitative characters of chilli with the treatmenteffects

Treatment	Days to germination	Germination (%)	Seedling height (cm)	Plant height (cm)	1st flowering (days)
Treatment 1	12.92[d]	78.24[c]	8.92[a]	63.91[b]	41.23[d]
Treatment 2	12.94[c]	79.22[b]	8.77[b]	64.29[a]	42.36c
Treatment 3	13.41[b]	80.36[a]	8.51[c]	63.87[c]	44.57b
Treatment 4	13.89[a]	74.39[d]	8.02[d]	61.22[d]	46.39a

Treatment	Primary branch	Fruit length (cm)	Fruit diameter (cm)	Pericarp thickness (mm)	Fruit weight (g)
Treatment 1	9.13[b]	12.68[a]	2.34[a]	0.79[a]	3.01[b]
Treatment 2	9.37[a]	12.61[b]	2.31[b]	0.68[b]	3.12[a]
Treatment 3	9.06[c]	11.23[c]	2.29[c]	0.61[c]	2.91[c]
Treatment 4	8.78[d]	10.54[d]	2.12[d]	0.54[d]	2.74[d]

Treatment	Fruit per plant	Yield (t/ha)	Chl A (mg/100g)	Chl B (mg/100g)	Total Chl (mg/100g)
Treatment 1	14.34[a]	18.74[a]	294.33[b]	107.33[b]	401.66[b]
Treatment 2	14.21[b]	17.71[b]	297.85[a]	109.11[a]	406.96[a]
Treatment 3	12.33[c]	15.34[c]	256.34[c]	93.65[c]	349.99[c]
Treatment 4	8.71[d]	12.21[d]	202.39[d]	73.86[d]	276.25[d]

Means followed by the same letters are not significant at 0.05 percent level according to Duncan's test.

Broccoli :

Organic treatment with nutrient supplement as SABUJ GOLD gave positively significant results for most of the characters related to growth, yield, and quality of broccoli compared to other treatments shown in table 2. There maximum germination (92.54%) occurred in T_2 followed by T_1. Minimum days to germination (11.25 days) observed in T_1 followed by T_2 (11.64 days). Whereas, the highest number of days to germination

(13.21 days) were recorded in treatment without any organic/inorganic inputs. Maximum plant height (52.8 cm) and the number of leaves (12.92) were observed in the T_1 followed by T_2 (*i.e.,* 51.26 cm and 12.71, respectively) and minimum estimates for these characters were recorded in T_4 (*i.e.,* 47.69 cm and 10.24, respectively). T_2 had shown positive results related to leaf length (41.97 cm), whereas the T_1 recorded maximum leaf width (16.38 cm). Minimum number of days (36.24 days) for head maturity was obtained in T_1 followed by T_2 (37.96 days); the maximum number of days (42.27 days) observed in treatment without any organic/inorganic inputs. The highest value of head circumference (39.61cm) observed in the T_1 followed by T_2 and the lowest value (33.63 cm) was observed in the treatment without any organic/ inorganic supplement. Incase of treatment with fully organic suppliment recorded to have a positive significant effect of SABUJ GOLD as an organic manure treatment for the parameters like individual head weight and yield per hectare. Maximum head weight (361.24 g) and yield (7.21 t/ha) were observed in T_1 followed by T_2; hence, minimum head weight (228.53 g) and yield (4.42 t/ha) was observed in the treatment 4. Maximum readings of quality attributes like chlorophyll A (324.65 mg/100 g), chlorophyll B (144.61 mg/100 g), total chlorophyll content (469.26 mg/100 g), beta carotene content (1.37 mg/100 g), ascorbic acid content (47.85 mg/100 g) were observed in T_1 followed by T_2.

Table 2 : Different quantitative and qualitative characters of broccoli with the treatment effects

Treatment	Days to Germination	Germination (%)	Plant height (cm)	Number of leaves	Leaf length (cm)
Treatment 1	11.25^{d}	92.33^{b}	52.86^{a}	12.92^{a}	41.56^{b}
Treatment 2	11.64^{c}	92.54^{a}	51.26^{b}	12.71^{b}	41.97^{a}
Treatment 3	12.97^{b}	90.21^{d}	50.37^{c}	12.37^{c}	40.12^{c}
Treatment 4	13.21^{a}	91.35^{c}	47.69^{d}	10.24^{d}	36.24^{d}

Treatment	Leaf width (cm)	Head harvest (days)	Head circumference (cm)	Head weight (g)	Yield (t/ha)
Treatment 1	16.38^{a}	36.24^{d}	39.61^{a}	361.24^{a}	7.21^{a}
Treatment 2	16.03^{b}	37.96^{c}	38.74^{b}	359.41^{b}	7.13^{b}
Treatment 3	15.39^{c}	39.71^{b}	36.51^{c}	344.91^{c}	6.87^{c}
Treatment 4	14.22^{d}	42.27^{a}	33.63^{d}	228.53^{d}	4.42^{d}

Treatment	Ascorbic acid (mg/100g)	â carotene (mg/100g)	Chl A (mg/100g)	Chl B (mg/100g)	Total Chl (mg/100g)
Treatment 1	47.85[a]	1.37[a]	324.65[a]	144.61[a]	469.26[a]
Treatment 2	47.54[b]	1.31[b]	321.33[b]	143.54[b]	464.87[b]
Treatment 3	41.32[c]	1.22[c]	309.19[c]	135.97[c]	445.16[c]
Treatment 4	36.24[d]	0.97[d]	289.45[d]	122.04[d]	411.49[d]

Means followed by the same letters are not significant at 0.05 percent level according to Duncan's test.

French Bean :

In the present investigation T_2 and T^1 showed significantly earlier in seed germination (*i.e.,*11.41 and 11.57 days, respectively) than the other treatments which indicated the importance of Sabuj Goldas organic manure in enhancement of seed germination that might be due to up-regulation of bio-chemicals pathways in dormant seed due to direct intervention of Sabuj Gold as organic manure in a positive direction (Table 3). Similar result obtained for germination percentage where T_2 showed maximum magnitude followed T_2 and both the treatments were statistically at per. Significantly highest plant height was noticed by T_1 (55.24 cm) followed by T_2 (52.36 cm). Whereas, the lowest value was recorded at the T_4 i.e., 42.29 cm. T_2 was recorded to be earliest in flowering (41.01 days) followed by T_1 (41.25 days). Significantly highest number of primary branches, pod length, pod diameter, pod weight and the number of pods per plant was recorded in the T_1 *i.e.,* 7.84, 14.71 cm, 2.71 cm, 3.37 g and 46.34, respectively followed by the T_2 (*i.e.,* 7.44, 14.25 cm, 2.65 cm, 3.34 g and 42.21). Table 3 exhibited that there was a predominant effect of sole treatment of Sabuj Gold as organic manure on different yield attributes. T_1 exhibited significantly the highest yield per plant (151.24 g) and yield (8.94 t/ha). Significantly second highest value was exhibited by the T_2 in case of yield per plant (144.68 g) and yield (8.07 t/ha). Whereas, the treatment based on sole chemical fertilizer as well as no external nutrient support showed a drastic reduction in yield indicated the effect of Sabuj Gold as organic manure in the up-regulation of yield parameters. In the case of qualitative characters, most of the traits viz., leaf, and fruit chlorophyll content were positively affected by the organic treatment. The highest total chlorophyll content of leaf (315.21 mg/100 g) and fruit (134.95 mg/100 g) was observed by the T_2 followed by the T_1 i.e., total chlorophyll content of leaf (310.99 mg/100 g) and fruit (126.22 mg/100 g).

Table 3 : Different quantitative and qualitative characters of french bean with the treatment effects

Treatment	Days to germination	Germination (%)	Plant height (cm)	1st flowering (days)	Primary branch
Treatment 1	11.57[c]	72.22[a]	55.24[a]	41.25[c]	7.84[a]
Treatment 2	11.41[d]	72.25[a]	52.36[b]	41.01[d]	7.44[b]
Treatment 3	12.87[b]	71.91[b]	46.87[c]	43.51[b]	6.34[c]
Treatment 4	14.03[a]	70.08[c]	42.29[d]	45.69[a]	5.44[d]

Treatment	Pod length (cm)	Pod dmt (cm)	Pod weight (g)	Pod per plant	Yield per plant (g)	Yield (t/ha)
Treatment 1	14.71[a]	2.71[a]	3.37[a]	46.34[a]	151.24[a]	8.94[a]
Treatment 2	14.25[b]	2.65[b]	3.34[b]	42.21[b]	144.68[b]	8.07[b]
Treatment 3	13.95[c]	2.01[c]	2.65[c]	37.88[c]	121.58[c]	6.01[c]
Treatment 4	12.88[d]	1.84[d]	2.01[d]	32.17[d]	88.27[d]	5.34[d]

Treatment	Mature pod			Mature leaf		
	Chl A (mg/100g)	Chl B (mg/100g)	Total Chl (mg/100g)	Chl A (mg/100g)	Chl B (mg/100g)	Total Chl (mg/100g)
Treatment 1	214.58[a]	96.41[b]	310.99[b]	98.45[b]	27.77[b]	126.22[b]
Treatment 2	201.98[b]	113.23[a]	315.21[a]	101.21[a]	33.74[a]	134.95[a]
Treatment 3	197.42[c]	84.61[c]	282.03[c]	93.54[c]	20.53[d]	114.07[d]
Treatment 4	186.44[d]	83.76[d]	270.2[d]	91.22[d]	25.73[c]	116.95[c]

Means followed by the same letters are not significant at 0.05 percent level according to Duncan's test.

Improved seed germination might be attributed to the role of some important microorganisms which influence in enhancing the easy availability of nitrogen, phosphorus, and potassium in the soil and making available to the germinating seeds with consequent enhancement in the cell metabolic activity resulting in higher germination (Copper, 1979 and Ram *et al.,* 2011). It has been reported that higher yield response of crops due to organic manure application is linked to the ability of organic manure to improve physical and biological properties of the soil resulting in better supply of nutrients to the plants (Saidu *et al.,* 2011; Ekwu and Nwokwu,

2012; Tiamiyu *et al.*, 2012). Organic manure increased the release of macro as well as micronutrients in the soil resulting in better extraction of nutrient uptake, increased fruit maturity period which in turn increased the yield (Ramesh, 1997). This agreed with the work of Singh *et al.* (2009), Prabhakar *et al.* (2011), Sarma *et al.* (2014), Patel *et al.* (2015), Islam *et al.* (2016), Sial *et al.* (2016), Vikas *et al.* (2016), Chandramohan *et al.* (2017), Mathews *et al.* (2017), Meena and Neeta (2017), Sharma *et al.* (2017) and Thakur *et al.* (2018).

References :

Chandramohan, R. G., Venkatachalapathi, V., Purna, D. R. G. and Hebbar, S .S. 2017. Study of Different Organic Manure Combination On Growth And Yield Of Chilli (*Capsicum annuum* L.). *Journal of Plant Archives* **17** (1): 472-474.

Copper, R. 1979.Bacterial fertilizers in the Soviet Unions. *Soil Fertility* **22**: 327-333.

Ekwu. L. G. and Nwokwu, G. N. 2012.Effect of plant spacing and planting date on the growth and yield of okra. *International Journal of Agriculture and Rural Development* **15**(2): 1041 1048.

Islam. M. A., Boyce, A. N., Rahman, M. M., Azirun, M. S. and Ashraf, M. A. 2016. Effects of organic fertilizers on the growth and yield of bush bean, winged bean and yard long bean. *Brazilian archives of biology and technology* **59**(1): e16160586.

Mathews, N. M. S., Bharani, A. and Nandhini, D. U. 2017. Influence of organic inputs on growth parameters of vegetable crops under terrace farming. *International Journal of Chemical Studies* **5**(5): 763-765.

Meena, K. S. and Neeta, S. K. 2017. Effect of organic manures on different plant varieties of chilli (Capsicum annum) under subabul (Leucaenaleucocephala) based Hortisilviculture system. *Journal of Medicinal Plants Studies* **5**(5): 273-276.

Prabhakar, M., Hebbar, S. S. and Nair, A. K. 2011. Growth and yield of French bean (*Phaseolus vulgaris* L.) under organic farming **13**(1): 72-73.

Patel, L. C., Chakrabarty, S. and Googoi, A. K. 2015. Organic cultivation of chilli - an assessment in West Tripura district of Tripura. *Journal of Eco-friendly Agriculture* **10**(1): 15-19.

Ramesh, D. 1997.Substitution of inorganic nitrogen through poultry and livestock wastes in lowland rice. M.Sc. (Ag.) Thesis,Tamil Nadu Agricultural University, Coimbatore, T.N. (INDIA).

Ram, M., Dawari, R. and Sharma, N. 2011. Effect of organic manures on basmati rice (Oryzasativa L.) under organic forming of rice–wheat cropping system.*International Journal of Agricultural and Crop Sciences* **3**: 76-84.

Saidu, A., Bello, L. Y., Tsado, E. K. and Ibrahim, F. K. 2011.Effect of cow dung on the performance of tomato. *International Journal of Applied Biological Research* **17**: 169-176.

Sarma, Phukon, M., Borgohain, R., Goswami, J. and Neog, M. 2014. Response of French bean (*Phaseolus vulgaris* L.) to organic manure, vermicompost and biofertilizers on

growth parameters and yield. *The Asian Journal of Horticulture* **9**(2): 386-389.

Sial, P., Tarai, R. K. and Sethy, B. K. 2016.Popularization of organic chilli cultivation in the Eastern Ghat high land zone of Odisha, India. *Journal of Applied and Natural Science* **8**(4): 1821-1826.

Sasikala, M., Indumathi, E., Radhika, S. and Sasireka, R. 2016. Effect of Seaweed Extract (Sargassumtenerrimum) on Seed Germination and growth of Tomato Plant (*Solanumlycopersicum*). *International journal of chemtech research* **9**(09): 285-293.

Sharma, S. K. and Thakur, K S. 2002.Effect of Azotobacter and nitrogen on plant growth and fruit yield of tomato. *Vegetable Science* **28** (2): 146-148.

Sharma, D., Rana, D. K., Shah, K. N., Singh., V. and Tanuja, 2017. Effect of various concentrations of bio-regulators and humic acid on growth, yield and quality of French bean (Phaseolus vulgaris L.) cv. contender under subtropical condition of garhwal hills. *Plant Archives* **17**(1): 647-650.

Singh, N. I. and Chauhan, J. S. 2009. Response of French Bean (*Phaseolus vulgaris* L.) to Organic Manures And Inorganic Fertilizer On Growth & Yield Parameters Under Irrigated Condition. *Nature and Science* **7**(5): 1545-0740.

Thakur, S., Thakur, R. and Mehta, D. K. 2018. Effect of biofertilizers on horticultural and yield traits in French bean var. Contender under dry temperate conditions of Kinnaur district of Himachal Pradesh. *Journal of Applied and Natural Science* **10** (1): 421 – 424.

Tiamiyu, R. A., Ahmed, H. G. and Muhammad, A. S. 2012. Effect of sources of organic manure on growth and yield of okra (Abelmoschusesculentus (L.) Moench) in Sokoto, Nigeria. *Nigerian Journal of Basic and Applied Science* **20**(3):213 -216.

Vikas, K., Ravi, S. and Pankaj, K. S. 2016.Effect of Vermicompost, Cow Dung and Different Organic Manure Combination on Growth and Yield of Chilli Crop (*Capsicum annuum* L) in India. *International Journal of Advances in Agricultural Science and Technology* **3**(3): 14-19.