

## Effect of FLORA in 15 colour varieties of potato

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**Abstract:** An experiment was conducted at the Horticulture Farm, BAU, Mymensingh during Nov 2016-Mar 2017. The experiment consisted of 15 colored potato and application of FLORA. The experiment conducted in randomized complete block design with three replications. Results revealed that at maximum vegetative stage (70 DAT), the maximum non. of branches/tiller(5.8) was recorded from V<sub>14</sub>(AC-10110)under FLORA spray while the minimum plant height (3) was recorded from V<sub>9</sub> (AC-10072) and V<sub>12</sub> (AC-10081) under Non-FLORA spray condition. At maximum vegetative stage (70 DAT), the maximum non. of branches/tiller(5.8) was recorded from V<sub>14</sub>(AC-10110)under FLORA spray while the minimum plant height (3) was recorded from V<sub>9</sub> (AC-10072) and V<sub>12</sub> (AC-10081) under Non-FLORA spray condition. The maximum no. of tubers /tiller (8.2) was recorded from V<sub>1</sub> (Cardinal) and V<sub>2</sub> (Sarpomira) under FLORA spray while the maximumno. of tuber /tillerunderNon-FLORA spray condition (7.4) was recorded also from V<sub>1</sub> (Cardinal). The maximum yield (9.15tons/ha) was recorded from V<sub>2</sub> (Sarpomira) under FLORA sprayed while the maximum yield under Non-FLORA sprayed condition (5.95 tons/ha) was recorded also from V<sub>2</sub> (Sarpomira). Considering the growth and yield performance in 15 varieties of potato, a growth enhancer chemical named FLORA may be recommended for farmers in cultivation of potato. For better, further studies are suggested to conduct under the same and/or different condition.

**Key words:** Potato, *Solanum tuberosum* , FLORA, colored potato, antioxidant.

### Introduction

Potato (alu) edible tuber of the cultivated plant *Solanum tuberosum* L. of the family Solanaceae (Purseglove, 1975). It was the major [crop](#) for the original Americans. It grows best in a cool, and dry climate. The major potato producing countries are the United States, Germany, Russia, Holland, and Poland. To the beginning of the 17th century the Portuguese navigators first brought potato to Indian subcontinent. The potato plant is a herbaceous annual, normally propagated by planting pieces of tubers that bear two or three eyes. In Bangladesh, potato is primarily used as a vegetable (Rahim, 2017), although in many countries of the world it constitutes the staple food and contributes more than 90% of the carbohydrate food source. Nutritionally, the tuber is rich in carbohydrates or starch and is a good source of protein, vitamin C and the B vitamins, potassium, phosphorus, and iron. Most of the minerals and protein are concentrated in a thin layer beneath the skin, and the skin itself is a source of food fibre. Several hundred varieties of potatoes are grown in the world among them there are some colored potatoes which have some medicinal value. These differ in appearance, tuber structure, size and color, time of maturity, cooking and marketing qualities, yield, and resistance to pests and diseases. Potato is widely cultivated in all the districts of Bangladesh during winter and one of the important vegetables in Bangladesh. BAU\_USDA project collected 28 color varieties of potato from University of Wisconsin, Madison, USA by Prof. Rahim (USDA report, 2012).

Although potato grown in winter seasons but it used round the year. One of the richest sources of antioxidants in the human diet is potato tubers (*Solanum tuberosum* L.) (Lachman *et al.* 2000) specially colored fleshed potato. Their antioxidant content decreases at a great deal from atherosclerotic processes, and is inhibited from cholesterol by the accumulation in blood serum and enhances the resistance of the vascular walls. Many antioxidants decrease risk of coronary heart disease and have free radical scavenging effect. The main potato antioxidants are polyphenols, ascorbic acid, carotenoids, tocopherols,  $\alpha$ -lipoic acid, and selenium. Polyphenolic compounds, esp.

flavonoids are effective antioxidants (Bors and Saran 1987) due their capability to scavenge free radicals of fatty acids and oxygen (Good, 1994). Vegetables and crops are significant sources of antioxidants in human nutrition either in direct consumption or in the form of vegetable juices. Justesen *et al.* (1997) estimated the daily flavonoid intake at 26 mg/day. Potato tubers present a very significant source of antioxidants (Al-Saikhan *et al.* 1995) in human nutrition, e.g. among fruits and vegetables they insure an average daily intake of about 64 mg polyphenols per capita in the U.S.A. and occupy the second place after tomatoes. From antioxidants they are richest in polyphenols (1.226–4.405 mg/kg) and ascorbic acid (170–990 mg/kg). Different colored varieties may show different contents of antioxidant, growth and yield of tubers. The present study was conducted to know the performances of different colored and non-colored varieties of potato treated with different chemicals.

FLORA is a chemical which environmental friendly and it helps plant to grow faster and enhances production rate. FLORA is a new technology produced by Devi Crop Science Pvt. Ltd. India which active ingredient is Nitrobenzene 20% (w/w). FLORA is a growth enhancer that increases the total production of different crops especially horticultural crops. FLORA is mainly used by foliar application. When FLORA sprayed on the foliage, the Nitrobenzene is absorbed through the cuticle by trans-laminar action and is transported to all parts of the plant including the root system. After entering in the plant system, it is influencing protein synthesis which enhances higher yield.

The present study was undertaken to observe growth performance of 15 varieties of potato under FLORA sprayed and non FLORA sprayed conditions; and to observe yield of different varieties of potato under FLORA sprayed and non FLORA sprayed conditions.

### Materials and Methods

**Location:** Horticulture Field Laboratory, Bangladesh Agricultural University, Mymensingh.

**Soil:** The soil of farm is sandy loam which belongs to the Old Brahmaputra Floodplain Alluvial Tract.

**Climate:** The experimental area is situated under the subtropical monsoon climate which is characterized by high temperature and heavy rainfall.

**Experimental Treatments:** The experiment consisted of two factors: Factor A: Different of potatoes varieties, viz. (i) Cardinal, (ii) Sarpomira, (iii) Courage, (iv) Dimond, (v) AC-10062, (vi) AC-10063, (vii) AC-10068, (viii) AC-10069, (ix) AC-10072, (x) AC-10074, (xi) AC-10076, (xii) AC-10081, (xiii) AC-10097 and (xv) AC-10110 and (xvi) AC-10190; Factor B: Treatments, (i) FLORA spray and (ii) No FLORA spray.

**Spraying of FLORA:** In this experiment solution of FLORA sprayed three times on potato plant. The experiment was run to observe the growth and yield of potato under FLORA applying condition and no FLORA applying condition.

The solution of FLORA sprayed (3ml/litre) on potato plant for three times; they were 25 DAP, 45 DAP and 65 DAP, respectively.

**Experimental design:** The two factor experiment will laid out in the Randomized Complete Block Design (RCBD) with three replications.

**Data collection:** In this experiment the different parameters of different potatoes varieties were studied viz.

(i) Height of plant, (ii) Number of branches per plant, (iii) Number of tubers per plant, (iv) Weight of tuber and (v) Yield.

**Statistical analysis:** The recorded data were compiled and analyzed by RCBD design to find out the statistical significance of experimental results. The means for all recorded data were calculated and analyzed statistically by using wasp2 software package to find out the statistical significance of the experimental results for all the characters were performed. The mean differences were evaluated by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984) at 5% level of significance and also by Least Significance Difference (LSD) test.

### Results and Discussion

The results of the effect of treatments on plant height, no. of branches and yield of potato varieties are as follow:

**Plant height:** At maximum vegetative stage (70 DAT), the maximum plant height (80.2 cm) was recorded from V<sub>14</sub> (AC-10110) under FLORA spray while the minimum plant height (39 cm) was recorded from V<sub>9</sub> (AC-10072) under Non-FLORA spray condition (Table 1).

**Table 1.** Plant height as affected by Flora application

Spray with	Variety	Plant height (cm)		
		30 DAP	50 DAP	70 DAP
FLORA	V1 (Cardinal)	35.4	59.6	74.2
	V2 (Sarpomira)	24.8	44.6	56.8
	V3 (Courage)	29.8	51.4	67.2
	V4 (Dimond)	22.6	41.8	57.6
	V5 (AC-10062)	19.8	38.8	51.4
	V6 (AC-10063)	23.2	46.6	59.8
	V7 (AC-10068)	20.2	35.8	48.4
	V8 (AC-10069)	24.8	51.6	64.6
	V9 (AC-10072)	18.6	29.2	39.4
	V10 (AC-10074)	19.4	32.6	41.4
	V11 (AC-10076)	26.2	55.8	68.4
	V12 (AC-10081)	21.6	38.2	50.8
	V13 (AC-10097)	28.2	46.2	58.4
	V14 (AC-10110)	39.8	67.4	80.2
	V15 (AC-10190)	29.8	52.4	68.4
Non FLORA	V1 (Cardinal)	31.2	52.8	70.2
	V2 (Sarpomira)	23.4	42.2	53.6
	V3 (Courage)	27.6	50.6	65.8
	V4 (Dimond)	21.8	38.8	54.8
	V5 (AC-10062)	18.6	36.8	50
	V6 (AC-10063)	21.2	43.8	55.4
	V7 (AC-10068)	21.4	37.8	50.4
	V8 (AC-10069)	26.2	52.8	65.6
	V9 (AC-10072)	18	28.8	39
	V10 (AC-10074)	19	29.4	39.6
	V11 (AC-10076)	25.6	54.2	67
	V12 (AC-10081)	19.2	33.2	44.8
	V13 (AC-10097)	25.8	43.4	54.8
	V14 (AC-10110)	32.4	60.4	75.2
	V15 (AC-10190)	27.2	50.4	66.6
Lsd (1%)		5.23	4.44	7.12
Level of significance		**	**	**

\*\* Significant at 1% level of probability

**No. of branches/tiller:** At maximum vegetative stage (70 DAT), the maximum non. of branches/tiller (5.8) was

recorded from V<sub>14</sub> (AC-10110) under FLORA spray while the minimum plant height (3) was recorded from V<sub>9</sub> (AC-

10072) and V<sub>12</sub> (AC-10081) under Non-FLORA spray condition (Table 2).

**No. of tubers /tiller:** The maximum no. of tuber /tiller (8.2) was recorded from V<sub>1</sub> (Cardinal) and V<sub>2</sub> (Sarpomira)

under FLORA spray while the maximum no. of tuber /tiller under Non-FLORA spray condition (7.4) was recorded also from V<sub>1</sub> (Cardinal) (Table 3).

**Table 2.** Number of branches/tiller in potato

Spray with	Variety	No. of branches/tiller		
		30 DAP	50 DAP	70 DAP
FLORA	V1 (Cardinal)	2.8	3.4	4
	V2 (Sarpomira)	3.2	4.4	5.2
	V3 (Courage)	2.6	3.4	4
	V4 (Dimond)	2.8	3.6	4.2
	V5 (AC-10062)	2.4	2.8	3.4
	V6 (AC-10063)	2.8	3.4	4
	V7 (AC-10068)	2	2.8	3.2
	V8 (AC-10069)	2.8	3.6	4.2
	V9 (AC-10072)	2.8	3.2	4
	V10 (AC-10074)	1.9	2.8	3.4
	V11 (AC-10076)	2.8	4.2	5.6
	V12 (AC-10081)	2	2.8	3.2
	V13 (AC-10097)	2.6	3.2	4
	V14 (AC-10110)	3.2	4.4	5.8
	V15 (AC-10190)	2.6	3	3.4
Non FLORA	V1 (Cardinal)	2.6	3	3.6
	V2 (Sarpomira)	2.8	3.4	3.8
	V3 (Courage)	2.6	3.2	3.8
	V4 (Dimond)	2.6	3.6	4
	V5 (AC-10062)	2.2	2.8	3.2
	V6 (AC-10063)	2.4	3	3.8
	V7 (AC-10068)	1.8	2.6	3
	V8 (AC-10069)	2.8	3.6	4
	V9 (AC-10072)	2	2.8	3.2
	V10 (AC-10074)	2.2	3	3.4
	V11 (AC-10076)	2.8	3.8	4.6
	V12 (AC-10081)	2	2.6	3
	V13 (AC-10097)	2.4	3.4	4
	V14 (AC-10110)	2.8	4	4.8
	V15 (AC-10190)	2.2	2.8	3.2
Lsd (1%)		0.01	0.21	0.42
Level of significance		**	**	**

\*\* Significant at 1% level of probability

**Table 3.** Number of tuber per tillers in harvesting

Variety	Number of tuber per tillers	
	FLORA	Non FLORA
V1 (Cardinal)	8.2	7.4
V2 (Sarpomira)	8.2	6.6
V3 (Courage)	6.8	7
V4 (Dimond)	4.6	3.8
V5 (AC-10062)	5	4.6
V6 (AC-10063)	5.4	4.9
V7 (AC-10068)	4	3.8
V8 (AC-10069)	7.2	6.4
V9 (AC-10072)	3.6	2.8
V10 (AC-10074)	4.4	4.2
V11 (AC-10076)	6	4.4
V12 (AC-10081)	4.8	3.8
V13 (AC-10097)	5	4
V14 (AC-10110)	5.2	4.4
V15 (AC-10190)	4	4.4
Lsd (1%)		0.55
Level of significance		**

\*\* Significant at 1% level of probability

**Yield:** The maximum yield (9.15tons/ha) was recorded from V<sub>2</sub> (Sarpomira) under FLORA sprayed while the

maximum yield under Non-FLORA sprayed condition (5.95 tons/ha) was recorded also from V<sub>2</sub> (Sarpomira).

Table shows that the yield performance of 15 varieties potato under FLORA and Non-FLORA spray condition. (Table 4).

**Table 4.** Yield in different treatment in 20 m<sup>2</sup> and in hectare

Spray with	Variety	Yield	
		kg/20 m <sup>2</sup>	ton/ha
FLORA	V1 (Cardinal)	12.95	6.48
	V2 (Sarpomira)	18.30	9.15
	V3 (Courage)	12.73	6.37
	V4 (Dimond)	8.17	4.09
	V5 (AC-10062)	4.91	2.46
	V6 (AC-10063)	8.59	4.30
	V7 (AC-10068)	2.86	1.43
	V8 (AC-10069)	13.49	6.74
	V9 (AC-10072)	4.00	2.00
	V10 (AC-10074)	3.40	1.70
	V11 (AC-10076)	11.33	5.67
	V12 (AC-10081)	4.34	2.17
	V13 (AC-10097)	6.45	3.23
	V14 (AC-10110)	8.33	4.17
	V15 (AC-10190)	11.49	5.75
Non FLORA	V1 (Cardinal)	7.45	3.73
	V2 (Sarpomira)	11.90	5.95
	V3 (Courage)	11.88	5.94
	V4 (Dimond)	6.54	3.27
	V5 (AC-10062)	4.45	2.23
	V6 (AC-10063)	6.16	3.08
	V7 (AC-10068)	1.88	0.94
	V8 (AC-10069)	10.48	5.24
	V9 (AC-10072)	2.92	1.46
	V10 (AC-10074)	2.80	1.40
	V11 (AC-10076)	10.02	5.01
	V12 (AC-10081)	3.74	1.87
	V13 (AC-10097)	4.66	2.33
	V14 (AC-10110)	7.55	3.78
	V15 (AC-10190)	9.24	4.62
	Lsd (1%)	1.22	0.21
	Level of significance	**	**

\*\* Significant at 1% level of probability

### Recommendation:

Considering the growth and yield performance in 15 varieties of potato, a growth enhancer chemical named FLORA may be recommended for farmers in cultivation of potato. For better, further studies are suggested to conduct under the same and/or different condition.

### References

- Al-Saikhan, M.S., Howard, L.R. and Miller, J.C. 1995. Antioxidant activity and total phenolics in different genotypes of potato (*Solanum tuberosum* L.). *Journal of Food Science*, 60: 341-343.
- Bors, W. and Saran, M. 1987. Radical scavenging by flavo noid antioxidants. *Free Radical Research Communication*, 2: 289-294.
- Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedure for Agricultural Research*. John voiley and Sons, New York, Chickester Brisbane, Toronto, Singapore. pp. 139-240.
- Good, D. 1994. The role of antioxidant vitamins. *American Journal of Medicine*, 96: 5-12.
- Justesen, U., Knuthsen, P. and Leth, T. 1997. Determination of plant polyphenols in Danish foodstuffs by HPLC- UV and LC-MS detection. *Cancer Letters (Shannon)*, 114: 165-167.
- Lachman J., Hamouz K., Orsák M. and Pivec V. 2000. Potato tubers as a significant source of antioxidants in human nutrition. *Rostlinná Výroba*, 46: 231-236.
- Purseglove, J.W. 1975. *Potato. Tropical Crops: Dicotyledons. World Crop Series.*
- Rahim, M. A. 2012. *Carrot Report*. 2012. USDA-ARS, University of Wisconsin, USA.
- Rahim, M.A. 2017. Performances of 24 colored potatoes. *Annual Report. Alliums Laboratory. BAU*