Madras Agric. J., **2018**, *105 (7-9)(2)*: 480-482; doi: 10.29321/MAJ.2018.000189

Enhancement of Physiochemical Parameters by Foliar application of Trifloxystrobin and Tebuconazole in Bt Cotton

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A field study was conducted to investigate the impact of different concentration of *Nativo* 75 WG (trifloxystrobin 50% + tebuconazole 25%) on physiochemical changes in Bunny hybrid Bt cotton. In the present study, *Nativo* 75 WG was sprayed twice at different concentration of @ 250, 300, 350 g/ha along with Carbendazim @ 500 g/ha. The samples were collected 40, 60, 80, 120 days after sowing (DAS). While examining one of the physiological parameter i.e. chlorophyll index, *Nativo* @ 300 g/ha revealed significantly higher value. Similarly in biochemical parameters, such as soluble protein, nitrate reductase activity and accumulation of phenols, *Nativo* @ 300 g/ha showed positive influence over the stages. The application of fungicide *Nativo* 75 WG improves the growth of the plant in cotton during flowering and boll formation stage which ultimately resulted in greenness of leaf. Thus, *Nativo* @ 300 g/ha can be successfully employed as a foliar spray under field conditions to enhance the physiochemical changes in Bunny hybrid Bt cotton.

Key words: Trifloxystrobin, Tebuconazole, SPAD, Cotton

India is an important grower of cotton on a global scale. It ranks second in global cotton production after China. India is accounting for about 18 % of the world cotton production. Strobilurins are a group of chemical compounds used in agriculture as fungicides. Fungicidal effect of Strobilurins on the metabolism of pathogenic fungi, positive influences on host physiology and consequently on yield formation have been recognized in cereals (Beck *et al*., 2000). Trifloxystrobin seems to increase the plant's ability to tolerate both biotic and abiotic stresses by increasing the antioxidative enzyme system. Tebuconazole is a triazole fungicide used agriculturally to treat plant pathogenic fungi. Until recently, the fungicides focused on control of phytopathogens with the sole purpose of reducing inoculum. After the launching of strobilurins and with the evolution of this group of chemical products, the concept of disease control gained new perspectives, especially when considering the advantages obtained by the action of positive physiological effects on these plants.

During the last decade of intense research on the fungicidal properties of strobilurins, the evidences of their direct influence in physiological processes of plants not infected or threatened by pathogens were strengthened. This activity was named as "physiological effect". The physiological effects of pyraclostrobin, a new molecule of strobilurin, were reviewed under several levels of complexity, from the greening effect frequently mentioned and the enhancement of stress factors in field and under controlled conditions (Wilson *et al*., 2003). Hence a thorough knowledge on the physiology of these compounds becomes warranted to step up the productivity. Moreover, no works have been carried out to study the effect of trifloxystrobin on Bt cotton. Trifloxystrobin + Tebuconazole (*Nativo)*, a fungicide seems to play a role in altering the physiology of different crops. With this background, an in depth investigation was carried out to develop appropriate foliar spray based on Trifloxystrobin fungicides for increasing growth and physiochemical changes of Bt cotton.

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Material and Methods

Field experiment was conducted to study the effect of different concentration of *Nativo* 75WG (trifloxystrobin + tebuconazole) on Bunny hybrid Bt cotton. Spraying with *Nativo* 75WG at different concentration along with *Carbendazim* (T1- control, T_2- trifloxystrobin + tebuconazole @ 250 g/ha, T_3- trifloxystrobin + tebuconazole @ 300 g/ha, T_4- trifloxystrobin + tebuconazole @ 350 g/ha, T5- carbendazim @ 500 g/ha) was carried out in 40 DAS, 60 DAS, 80 DAS and 120 DAS. Two sprays were given during flowering (40-60 DAS) and boll formation stage (60-80 DAS) as per treatments and observations were recorded on physiological and biochemical analysis in all treatments. The observations on physiological parameters like chlorophyll index by Chlorophyll Meter (SPAD 502), designed by the Soil Plant Analysis Development (SPAD) section, Minolta Camera Co. Ltd., Japan (Peg *et al.,* 1993). The soluble protein content by the method of Lowry *et al.* (1951) and expressed in mg g^{-1} fresh weight. Nitrate reductase activity was estimated in the physiologically active leaf by the method of Nicholas *et al.* (1976) and expressed as mg NO_2 g^{-1} hr^{-1} fresh weight. Total phenol content

of leaf was estimated by the method of Mallick and Singh (1980) and expressed as mg g^{-1} fresh weight.

Results and Discussion

Chlorophyll index value

The Chlorophyll Meter (SPAD) instantly measures the amount of chlorophyll or "greenness" of plants. Chlorophyll meter provides a simple, quick and non-destructive method for estimating the relative value of chlorophyll concentration. A significant increase in chlorophyll index was observed in the present study due to application of trifloxystrobin coupled with tebuconazole, with a maximum of 10.4 per cent in *Nativo* @ 300 g/ha (T_3) on 120 DAS (Fig. 1). The increase in chlorophyll index due to application of systemic fungicide, cyproconazole and propiconazole was reported by Hennouni *et al*. (2012). A slight increase in relative chlorophyll content measured by SPAD meter was observed due to triazole applications in barley (Gortz *et al*., 2008).

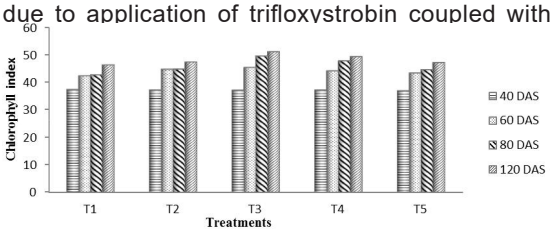

Fig. 1. Effect of trifloxystrobin + tebuconazole on chlorophyll index

Leaf soluble protein content

In the present study, among five treatments, *Nativo* @ 300 g/ha showed significant increase in the soluble protein content at 120 DAS with 7.5 percent over the control (Table. 1). The results obtained by present study for increased soluble protein content was strongly supported by Wu and Tiedemann (2001) who reported a significant increase in soluble protein as a result of azoxystrobin application in wheat. The increment in soluble protein due to triazole fungicide, triadimefon (Jaleel *et al.,* 2007) in *Catharanthus roseus,* hexaconazole and paclobutrazol in carrot.

Table 1. Effect of trifloxystrobin + tebuconazole on leaf soluble protein content in Bunny hybrid Bt cotton

Leaf soluble protein content (mg g^{-1}) / days				
Treatment	**40**	**60**	**80**	**120**
T_1-Untreated control	6.07	7.53	8.18	11.67
T_2-Nativo @ 250 g/ha	5.99	7.87	8.32	11.43
T_3-Nativo @ 300 g/ha	6.09	8.01	9.18	12.54
T_4-Nativo @ 350 g/ha	6.00	7.98	8.41	12.36
T_5-Carbendazim @ 500 g/ha	6.03	7.80	8.23	12.24
Mean	6.04	7.84	8.46	12.05
SE(d)	0.06	0.07	0.08	0.11
CD (P=0.05)	NS	0.16	0.18	0.24

Nitrate reductase enzyme

The application of *Nativo* @ 300 g/ha also displayed a significant increase in NR activity and the maximum increase of 12 per cent at 120 DAS (Table. 2) when compared to untreated control. Similar increase in NR activity was observed by Glaab and Kaiser (1999) that the application of strobilurins, kresoxim-methyl (KROM) in spinach caused an additional influence of NR activity *via* acidification of the cytoplasm and partly through prevention of degradation of protein. NR enzyme is highly sensitive towards oxidative stress (senescence) and the decreased enzyme activity may be due to break down of proteins (Kalarani and Jeyakumar, 1998).

Table 2. Effect of trifloxystrobin + tebuconazole on NRase activity

	NRase activity (µg NO_2 g^{-1} hr^{-1}) / days			
Treatment	**40**	**60**	**80**	**120**
T_1-Untreated control	35.41	41.02	52.64	50.54
T_2-Nativo @ 250 g/ha	35.34	44.42	56.15	51.62
T_3-Nativo @ 300 g/ha	34.78	45.65	58.42	56.63
T_4-Nativo @ 350 g/ha	35.12	44.41	57.58	54.63
T_5-Carbendazim @ 500 g/ha	35.02	43.65	54.51	52.42
Mean	35.13	43.83	55.86	53.17
SE(d)	0.32	0.41	0.52	0.50
CD (P=0.05)	NS	0.89	1.14	1.09

Total phenols

A significant increase in total phenols was observed in Bt cotton at all growth stages, excluding 40 DAS. Application of strobilurin along with triazole fungicides enhanced the content of phenols to a maximum of 12.5 per cent (Table. 3). According to Mohamed *et al*. (2010) Uniconazole increased significantly the total phenol content of cotton plants.

The earlier findings of Jaleel et al. (2009) in turmeric and Lakshmanan et al. (2007) in Plectranthus also indicated a significant increase in total phenol content due to fungicide application.

Table 3. Effect of trifloxystrobin + tebuconazole on total phenols

Treatment	Total Phenols (mg g^{-1})			
	40 DAS	60 DAS	80 DAS	120 DAS
T_1-Untreated control	1.99	3.18	3.34	3.84
T_2-Nativo @ 250 g/ha	2.48	3.44	3.72	4.14
T_3-Nativo @ 300 g/ha	2.42	3.86	4.08	4.32
T_4-Nativo @ 350 g/ha	2.21	3.54	3.82	4.28
T_5-Carbendazim @ 500 g/ha	2.36	3.38	3.54	4.04
Mean	2.29	3.48	3.70	4.12
SE(d)	0.10	0.34	0.04	0.04
CD (P=0.05)	NS	0.07	0.08	0.08

he fungicide Nativo 75WG (trifloxystrobin + tebuconazole) @ 300 g/ha increased the physiological character like chlorophyll index indicated the extended greenness in Bt cotton. An increment as well as maintenance of chlorophyll, soluble protein, accumulation of phenols and nitrate reductase activity was also noticed at the time of flowering and fruiting in Bt cotton. Thus, fungicide Nativo 75WG improve the physiochemical character of the cotton plant during flowering and boll formation stage which ultimately resulted in greenness of leaf.

References

Beck, C., Koch, H., Oerke, B.C. and Dehne, H.W. 2000. Einfluss von Strobilurinen auf Physiologic und Ertrag von Winterweizen. *Mitt. Biol. Bundesanst. Land-Forstwirtsch.* **376:** 479-480.

Glaab, J. and Kaiser, W.M. 1999. Increased nitrate reductase activity in leaf tissue after application of the fungicide Kresoxim-methyl. *Planta,* **207:** 442-448.

Gortz, A., Oerke, E.C., Puhl, T. and Steiner, U. 2008. Effect of environmental conditions on plant growth regulator activity of fungicidal seed treatments of barley. *J. Appl. Bot. Food Quality*., **82:** 60-68.

Hennouni, N., Djebar, M.R. and Djebar-Berrebbah, H. 2012. Effect of systemic fungicide (combination of cyproconazole and propiconazole) newly introduced in Algeria on Septoria of two varieties of wheat (*Triticum durum* Desf). *Adv. Environ. Biol.,* **6(4):** 1433-1441.

Jaleel, C.A., Zhao, C., Mohamed, S., Al Juburin, H.M., Moussa, H.R., Gomathinayagam, M. and Paneerselvam, R.. 2009. Alterations in sucrose metabolizing enzyme activities and total phenol content of *Curcuma longa* L. as affected by different triazole compounds. *Front. Biol.,* **4(4):** 419-423.

Jaleel, C.A., Gopi, R. and Panneerselvam, R. 2007. Alterations in lipid peroxidation, electrolyte leakage, and proline metabolism in *Catharanthus roseus* under treatment with triadimefon, a systemic fungicide. *Comptes Rendus Biologies,* **330(12):** 905-912.

Kalarani, M.K. and Jeyakumar, P. 1998. Effect of nutrient and NAA spray on physiological changes in soybean. *Indian J. Plant Physiol.,* **3:** 226-228.

Lakshmanan, G.M.A., Jaleel, C.A., Gomathinayagam, M. and Panneerselvam, R. 2007. Changes in antioxidant potential and sink organ dry matter with pigment accumulation induced by hexaconazole in Plectranthus forskholii Briq. *Comptes Rendus Biologies,* **330:** 814-820.

Lowry, O.H., Rose Brough, N.T., Ferr, L.A. and Rawdall, R.J. 1951. Protein measurement with phenol reagent. *J. Biol. Chem.,* **193:** 263-275.

Mallick, C.P. and Singh, M.B. 1980. In: Plant Enzymology and Histo Enzymology. Kalyani Publishers, New Delhi, p. 286.

Mohamed, E.M., Hanan, F., Abdel-Hafez. and Mahasen, A.A.A. 2010. Inducing resistance in cotton plants, gossypium barbadense. Against some insect pests by plant growth regulators. *Egypt. J. Agric. Res.,* **88 (1):** 45-75.

Nicholas, J.C., Harper, J.E. and Haema, R.H. 1976. Nitrate reductase activity in soybeans. Effect of light and temperature. *Plant Physiol.,* **58:** 731-735.

Peg, S., Felipe, S., Garcia, V., Rebacca, C. and Cassman, K.G. 1993. Adjustment for specific leaf weight improves chlorophyll meters estimate of leaf nitrogen concentration. *Agron. J.,* **85:** 987-990.

Wilson, S.V., Marco, A.T.R., Edson, B., Nilton, D.E. and Souza. 2003. Physiological effects of the strobilurin fungicides on plants. Publ. UEPG Ci.Exatas Terra, CI. *Agr. Eng., Ponta Grossa.,* **9(3):** 59-68.

Wu, Y.X. and Tiedemann, A.V. 2001. Physiological effects of azoxystrobin and j epoxiconazole on senescence and the oxidative status of Wheat. *Pesticide Biochem. Physiol.,* **71:** 1-10.