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Original Article

Difenoconazole and Tricyclazole induced changes in photosynthetic pigments of Lycopersicon esculentum L.

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Abstract
In the present study an attempt was made to study the effect of Difenoconazole and Tricyclazole on Photosynthetic characters of Lycopersicon esculentum L. L. esculentum belongs to the Family Solanaceae. The fungicides Tricyclazole, 12mgL⁻¹ and Difenoconazole 10mgL⁻¹ were used by soil drenching on 40, 55, 70 and 85 days after planting (DAP). The plants were uprooted randomly on 45, 60, 75 and 90 DAP and used for estimating chlorophyll a, chlorophyll b, total chlorophyll, carotenoid, xanthophylls and anthocyanin content. Tricyclazole shows higher chlorophyll content than difenoconazole when compare to control. Difenoconazole treated plants showed increase in carotenoid, xanthophylls and anthocyanin content than tricyclazole when compared to control. However both the treatments increased the photosynthetic pigments. From the results it can be concluded that tricyclazole and difenoconazole treatments altered the photosynthetic pigments of L. esculentum.

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Keywords: Tricyclazole, Difenoconazole, Lycopersicon esculentum, Photosynthetic pigments.

1. INTRODUCTION
Lycopersicon esculentum L. (Tomato) is a herb belongs to Solanaceae family. L. esculentum, is a short life cycle plants can grow as high as 1 to 3 meters. It is the world’s largest vegetable crop after potato and sweet potato but it tops the list of canned vegetables. It is an important condiment in most diets and a very cheap source of vitamins. It also contains a large quantity of water, calcium and niacin all of which are of great importance in the metabolic activities of man. Tomato is a good source of vitamin A, C and E and minerals, that are good for body and protect body against diseases (1).

Tomatoes and tomato based foods are considered healthy foods for several reasons. They are low in fat and Calories, cholesterol free and good source of fiber and protein. In addition tomatoes are rich in vitamin A and C, β- Carotene, potassium and lycopene. There has been a growing interest in investigating the ability of lycopene to function as an antioxidant may contribute to a reduction in disease risk (2).

The triazole compounds are the largest and most important group of systemic compounds developed for fungal disease in plants. Triazole compounds are mainly used as growth retardants and also the stress protectants in many crops. Many of the triazole compounds have both fungi toxic and plant growth regulating properties (3). They tend to be much more effective than many other plant growth regulators and generally require blow rate of application (4).

More recently it was found that the triazole compounds are able to protect plants from the environmental stress conditions. (5). The triazole mediated stress protection is often explained in terms of hormonal changes such as increase in cytokinins, a transient rise in ABA, decrease in ethylene (6-7).

Difenoconazole , cis, trans- 3- chloro-4-(4-methyl- 2-(1H-1,2,4-triazol-1-ylmethyl)-1,3-dioxafan-2-Yl)phrynyl-4- chlorophenylether)phrynyl-4-chlorophenyl ether, is a broad spectrum fungicide, which is one of the most important and widely used pesticides for disease control in tomato fruits. Its extensive application may led to undesirable side effects on human health and environmental quality (8). It is extensively used in a wide range of crops in many countries for its good control of various fungal diseases.(9-14).

Tricyclazole (5-methyl-1,2,4-triazolo (3,4-b) benzothiazole, is a medium soluble pesticides. So it may be easily washed from the plant by water. Tricyclazole was certified by World Health Organization as a least perilous pesticide (15). The potential environment risk of tricyclazole resulted
in a rough estimation of parameters for model application (16). Therefore a detailed investigation on the behavior of tricyclazole under tomato plants may be useful for risk assessment. However, work on the use of these triazole compounds to increase the yield of tomatoes. Hence, the present study reveals the effect of TCZ and DCZ compounds on photosynthetic pigments of L.esculentum.

2. Materials and Methods

The seeds of Lycopersicum esculentum L were collected from Tamil Nadu Agricultural University, Tamil Nadu, India. Tricyclazole and difenoconazole is a triazolic group of fungicides having plant growth regulating properties obtained as SAMAR 75% and SCORE 25% obtained from Syngenta India Ltd, Mumbai used for the study. The experimental part of this work was carried out in botanical garden and biotechnology lab, Department of Botany, Annamalai University, Tamil Nadu. 12mgL^-1 of tricyclazole 10mgL^-1 of difenoconazole were used to determine the effect of these plant growth regulating compounds on photosynthetic pigments of L.esculentum L.

2.1 Methods

The seeds were spread on the nursery bed. The plants were allowed to grow till 25 days with regular irrigation. The selected plants were transplanted to the pots. The treatments were given on 40, 55, 70 and 85 days after planting (DAP) by soil drenching. The plants were taken randomly on 45, 60, 75 and 90 DAP and leaves were separated. It is used for the analysis of photosynthetic pigments of Lycopersicon esculentum L.

2.2 Estimation of Photosynthetic pigments

2.2.1 Estimation of chlorophyll and Carotenoid Contents

Chlorophyll and carotenoid contents were extracted from the leaves and estimated according to the method (17).

Extraction: Five hundred milligrams of fresh leaf material was ground with 10ml of 80 percent acetone and centrifuged at 2500 rpm for 10mins. The extract was transferred to a tube and made up to 10ml with 80 percent acetone and assayed immediately.

Estimation: Three millilitres aliquots of the extract were transferred to cuvette and the absorbance was measured at 645, 663 and 480 nm with a spectrophotometer (U-200 1- Hitachi) against 80 percent acetone as blank.

2.3 Estimation of Xanthophyll

2.3.1 Estimation of Xanthophyll Contents

Xanthophyll contents were extracted from the leaves and estimated according to the method (18).

Extraction: Five hundred milligrams of fresh leaf material was ground with 10ml of 80 percent ethanol and centrifuged at 800 rpm for 10mins. The extract was transferred to a tube and made up to 10ml with 80 percent ethanol and assayed immediately.

Estimation: Three millilitres aliquots of the extract were transferred to cuvette and the absorbance was measured at 525nm with a spectrophotometer (U-200 1- Hitachi) against 80 percent ethanol as blank.

Anthocyanin content was extracted and estimated by the method of (19).

3. Statistics

Each treatment was analyzed with at least three replicates and standard deviation was calculated. The data expressed in mean ±SD of three replicates.

4. Results and Discussion

The chlorophyll content of the leaves increased with the age of the plant. Triazole compounds gradually increased in the chlorophyll content, when compared to control. Tricyclazole treated plants showed increased chlorophyll content when compared to difenoconazole. The maximum increase of chlorophyll ‘a’ was found on 75 DAP in tricyclazole treatments and it was 108.16 percent were as difenoconazole is 106.31 percent over control (Fig.1). chlorophyll ‘b’ content was high in tricyclazole on 75 DAP with 108.60 and difenoconazole was 106.60 percent control (Fig.2). Total chlorophyll of L. esculentum get increased with tricyclazole with 107.89 percent and difenoconazole with 106.31 percent on 75 DAP over control (Fig.3). Similar results were obtained when mentha piperia was treated under difenoconazole (20). Paclabutrazol treated barley seedlings (21) carrot (3) potato.(22). Brassica carinata (23) showed high chlorophyll and carotenoid content when treated under propiconazole. Propiconazole increased the chlorophyll content in Basella alba.(24).
The carotenoid content of *L. esculentum* leaves increased with the age in control and all treated plants. The higher carotenoid content (Fig.4) were observed under tricyclazole treatments on 75 DAP and it was 105.17 percent over control were as difenoconazole showed 103.44 percent over control. In *mentha piperita, the carotenoid content increased in leaves under difenoconazole treatment (20). Triazole treatment increased the carotenoid content to a higher level in cucumber (25) maize plants (26). Uniconazole treatment stimulated the carotenoid formation in *L.esculentum* seedlings. (27). Propiconazole induced total carotenoid content in *basella alba* (24).

Triazole treatments increased the xanthophylls content in *L. esculentum* in early stages, than control. Tricyclazole treatments shows (Fig.5) increase in xanthophylls content with the 110.20 percent over control were as difenoconazole showed 112.02 percent over control on 75 DAP. Propiconazole and hexaconazole treatment increased the xanthophylls content in *plectranthus vettiveroides* (28). An increased xanthophylls content was reported under propiconazole treatment in *Basella alba* (24).

Triazole treatments increased the anthocyanin content in *Lesculentum* difenoconazole treatment (Fig.6) showed increased anthocyanin content with the percent of 112.01 were as . Tricyclazole showed 110.50 percent over control on 75 DAP. Propiconazole and hexaconazole increased the anthocyanin content in *plectranthus vettiveroides* (28). Anthocyanin content was reported in triadimefon treated Catharanthus and sweet potato under triadimefon, (29 - 30). Paclabutrazol treated potato tuber (31).

5. Conclusion
From the results of this investigation it can be concluded that the application of triazole compounds could be well used as a potential tool to increase alter the photosynthetic content of *L.esculentum*. However the date presented here reflect the importance of a physiological analysis of plant response to fungicides treatments which must accompany field experiments and evaluation.

REFERENCES


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