

Influence of Hexaconazole and Triazophos on Photosynthetic Pigments in Spinach and Gaur

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Abstract

*The paper deals with effect of Hexaconazole 5% EC and Triazophos 40% EC on photosynthetic pigments in spinach (*Spinacea oleracea* L.) and guar (*Cyamopsis tetragonolobus* L. Taub.) after seed treatment followed by foliar sprays. The concentration of pesticides was range from 0.05, 0.1, 0.15, 0.2 and 0.3% for this investigation. The Hexaconazole stimulated chlorophylls at lower concentrations after first foliar spray however greatly stimulated after second foliar spray in both vegetables. The Triazophos also stimulated chlorophylls in guar but was detrimental in spinach.*

Keywords: *Hexaconazole, Triazophos, Spinacea, Cyamopsis, Chlorophyll, Carotenoid.*

Introduction:

Hexaconazole (fungicide) and Triazophos (insecticide) are broad spectrum triazole systemic pesticides that control leaf spot and leaf minors respectively in spinach and guar. Triazole pesticides are pest toxic and have plant growth regulating properties (Jaleel *et al.*⁷) and are used as stress protectants (Angel and Flether¹). However, the plant absorbs a certain amount of pesticides that changes the plant's metabolism (Koehle *et al.*¹¹). In present investigation the effect of Hexaconazole and Triazophos on photosynthetic pigments in spinach and guar were studied after seed treatment followed by foliar sprays.

Materials and Methods:

The healthy seeds of spinach and guar were treated with 0.05, 0.1, 0.15, 0.2 and 0.3% concentrations of Hexaconazole and Triazophos pesticides separately for 12 h. The treated seeds were thoroughly washed with distilled water and sown in earthen pots containing a mixture of garden soil and manure (3:1). The foliar sprays of these pesticides were applied after 10th and 25th day of growth. The analyses of photosynthetic pigments

were carried out on 15th and 30th day. The chlorophyll were estimated by methods of Arnon² and carotenoids as described by Kirk and Allen¹⁰.

Results and Discussion:

The effect of Hexaconazole seed treatment followed by foliar spray on chlorophyll content is depicted in table 1 and 2. It is evident from tables that first foliar spray after seed treatment increased chlorophyll a, chlorophyll b and total chlorophylls at lower concentrations while detrimental at higher concentrations in both vegetables. Chlorophyll a/b were increased in all concentrations of Hexaconazole in spinach where there was marginal decrease in guar. The carotenoid content increased with increasing concentrations in both vegetables. The second foliar spray of Hexaconazole increased all photosynthetic pigments at lower concentrations in both vegetables except for chlorophyll a/b.

The effect of Triazophos seed treatment followed by foliar spray on chlorophyll content is depicted in table 1 and 2. It was observed that chlorophyll a, chlorophyll b, total chlorophylls and carotenoids decreased in spinach as compared to control in all concentrations of Triazophos. The

chlorophyll a/b was stimulated slightly in all concentrations, maximum value was recorded at lower concentration in spinach. After second foliar spray in spinach, the chlorophyll b and total chlorophyll increased at lower concentrations while chlorophyll a, chlorophyll a/b and carotenoids decreased as compared to control. In guar, the first foliar spray of Triazophos increased chlorophyll a, chlorophyll b, total chlorophyll, chlorophyll a/b at lower concentrations while carotenoids increased with increasing concentrations. The maximum value of carotenoids recorded at 0.15%, 0.20% and 0.30 % Triazophos after first foliar spray. The second foliar spray of Triazophos in guar increased all photosynthetic pigments in all concentrations. The maximum value of chlorophyll pigments recorded at 0.15%, 0.20% of Triazophos but the carotenoids showed maximum value at 0.15%, 0.20%, 0.30% Triazophos. There are several reports showing stimulatory as well as inhibitory actions of pesticides. Pesticides such as Benalate, Mancozeb, Zineb, Carbendazim, Calixin, Brestan, Hexaconazole, Triadimefon and Triadimenol had been reported to stimulate chlorophyll pigments in different plants (Bansal *et al.*³; Karadge and Karne⁹, Godara and Thakore⁵, Surichandraselvan and Narayanswamy¹⁹, Kotasthane¹², Singh and Thakore¹⁶; Sundarvelu *et al.*¹⁷, Gupta Renu *et al.*⁶, Kashyap and Kumar²⁰).

On a contrary a negative effect of pesticides were observed by Kumar and Khan¹³, Surekha Rani¹⁸; Vidyasagar *et al.*²¹ Okmen *et al.*¹⁴. Very few reports available showing stimulatory actions of pesticides (Bogdanov and Gancheva⁴; Rouchaud *et al.*¹⁵ Jaleel *et al.*⁸).

The present investigation showed stimulatory effect of Hexaconazole in both vegetables (Jaleel *et al.*⁸;a) however Triazophos act stimulatory in lower concentrations in guar but detrimental in spinach. The organophosphorus insecticides have high affinity to chloroplast

resulting in an inhibition and stimulation of electron transfer system causing decomposition or regeneration of chlorophyll in spinach and guar (Yukimoto²²).

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Table 1: Effect of Hexaconazole and Triazophos seed treatment and foliar spray on photosynthetic pigments of spinach (*Spinacia oleracea* L.)

Pesticide Conc. %	First foliar spray					Second foliar spray				
	Chl.a	Chl.b	Total Chl.	Chl.a/b	Carotenoids	Chl.a	Chl.b	Total Chl.	Chl.a/b	Carotenoids
Control	29.8 (± 0.25)	30.9 (± 0.37)	60.7 (± 0.79)	0.96 (± 0.07)	18.35 (± 0.18)	41.80 (± 0.45)	30.91 (± 0.16)	72.71 (± 0.83)	1.35 (± 0.11)	28.90 (± 0.25)
Hexaconazole % V/V										
0.05	36.97 (± 0.37)	31.45 (± 0.35)	68.42 (± 0.65)	1.17 (± 0.15)	19.04 (± 0.12)	43.75 (± 0.31)	39.73 (± 0.29)	83.48 (± 0.75)	1.10 (± 0.18)	30.76 (± 0.42)
0.10	44.31 (± 0.43)	39.87 (± 0.35)	84.18 (± 0.72)	1.11 (± 0.21)	19.65 (± 0.22)	47.12 (± 0.34)	43.92 (± 0.33)	91.04 (± 0.67)	1.07 (± 0.15)	32.88 (± 0.32)
0.15	31.63 (± 0.27)	28.76 (± 0.38)	60.39 (± 0.40)	1.09 (± 0.13)	20.34 (± 0.29)	45.32 (± 0.41)	41.98 (± 0.40)	87.30 (± 0.73)	1.07 (± 0.11)	34.54 (± 0.37)
0.20	26.38 (± 0.37)	24.65 (± 0.31)	51.03 (± 0.59)	1.07 (± 0.19)	21.98 (± 0.18)	42.98 (± 0.48)	40.79 (± 0.38)	83.77 (± 0.81)	1.05 (± 0.21)	36.01 (± 0.29)
0.30	21.80 (± 0.39)	20.82 (± 0.45)	42.62 (± 0.45)	1.04 (± 0.14)	20.12 (± 0.19)	39.48 (± 0.38)	37.32 (± 0.40)	76.80 (± 0.74)	1.05 (± 0.10)	38.32 (± 0.27)
Triazophos % V/V										
0.05	28.23 (± 0.29)	26.18 (± 0.24)	54.41 (± 0.43)	1.07 (± 0.09)	18.04 (± 0.20)	39.72 (± 0.33)	38.18 (± 0.27)	77.90 (± 0.65)	1.04 (± 0.05)	28.49 (± 0.22)
0.10	26.78 (± 0.21)	25.12 (± 0.21)	51.90 (± 0.51)	1.06 (± 0.13)	17.99 (± 0.27)	37.53 (± 0.26)	36.09 (± 0.30)	73.62 (± 0.58)	1.03 (± 0.16)	27.98 (± 0.25)
0.15	25.31 (± 0.19)	24.54 (± 0.26)	49.85 (± 0.48)	1.03 (± 0.17)	17.34 (± 0.37)	35.65 (± 0.28)	34.68 (± 0.29)	70.33 (± 0.75)	1.02 (± 0.11)	26.65 (± 0.32)
0.20	24.43 (± 0.26)	23.86 (± 0.33)	48.26 (± 0.41)	1.02 (± 0.09)	16.12 (± 0.42)	34.78 (± 0.23)	33.87 (± 0.17)	68.65 (± 0.63)	1.02 (± 0.12)	26.01 (± 0.33)
0.30	18.80 (± 0.21)	18.67 (± 0.19)	37.47 (± 0.42)	1.00 (± 0.10)	13.36 (± 0.15)	31.32 (± 0.39)	30.59 (± 0.28)	61.91 (± 0.52)	1.02 (± 0.19)	24.32 (± 0.27)

Values are mean of three determinations. ; Values in parenthesis are standard deviation.

Values of Chl.a, Chl.b, Total Chl and Carotenoids are expressed in mg.100g⁻¹ fresh weight.

Table 2 : Effect of Hexaconazole and Triazophos seed treatment and foliar spray on photosynthetic pigments of guar (*Cyamopsis tetragonolobus* L. Taub.)

Pesticide Conc. %	First foliar spray					Second foliar spray				
	Chl.a	Chl.b	Total Chl.	Chl.a/b	Carotenoids	Chl.a	Chl.b	Total Chl.	Chl.a/b	Carotenoids
Control	23.12 (± 0.19)	21.80 (± 0.25)	44.92 (± 0.48)	1.06 (± 0.08)	26.90 (± 0.21)	37.71 (± 0.31)	36.89 (± 0.41)	74.60 (± 0.51)	1.02 (± 0.11)	36.90 (± 0.38)
Hexaconazole % V/V										
0.05	25.57 (± 0.39)	24.67 (± 0.22)	50.24 (± 0.41)	1.03 (± 0.17)	27.10 (± 0.28)	45.35 (± 0.42)	39.13 (± 0.22)	84.48 (± 0.64)	1.15 (± 0.21)	40.76 (± 0.20)
0.10	38.80 (± 0.35)	36.17 (± 0.29)	74.97 (± 0.58)	1.07 (± 0.10)	27.80 (± 0.23)	53.12 (± 0.43)	43.92 (± 0.31)	97.04 (± 0.75)	1.20 (± 0.18)	42.88 (± 0.39)
0.15	39.27 (± 0.41)	38.31 (± 0.33)	77.58 (± 0.61)	1.02 (± 0.09)	28.87 (± 0.19)	47.82 (± 0.41)	41.98 (± 0.32)	89.80 (± 0.65)	1.13 (± 0.11)	47.54 (± 0.33)
0.20	23.18 (± 0.34)	22.78 (± 0.26)	45.96 (± 0.38)	1.01 (± 0.14)	29.67 (± 0.31)	44.16 (± 0.49)	40.79 (± 0.36)	84.95 (± 0.61)	1.08 (± 0.15)	56.01 (± 0.32)
0.30	21.96 (± 0.25)	21.74 (± 0.15)	43.70 (± 0.32)	1.01 (± 0.05)	30.10 (± 0.32)	38.91 (± 0.37)	36.32 (± 0.24)	75.23 (± 0.63)	1.07 (± 0.09)	68.32 (± 0.38)
Triazophos % V/V										
0.05	27.53 (± 0.32)	23.21 (± 0.39)	50.74 (± 0.47)	1.18 (± 0.18)	30.65 (± 0.32)	54.65 (± 0.41)	39.13 (± 0.36)	93.75 (± 0.74)	1.39 (± 0.21)	41.15 (± 0.49)
0.10	31.54 (± 0.38)	28.47 (± 0.28)	60.01 (± 0.59)	1.10 (± 0.9)	33.87 (± 0.27)	57.53 (± 0.49)	46.43 (± 0.44)	103.96 (± 0.95)	1.23 (± 0.20)	44.28 (± 0.42)
0.15	32.67 (± 0.35)	28.39 (± 0.24)	61.06 (± 0.65)	1.15 (± 0.14)	37.13 (± 0.25)	60.82 (± 0.57)	48.98 (± 0.53)	109.8 (± 0.91)	1.24 (± 0.21)	46.74 (± 0.36)
0.20	18.11 (± 0.17)	16.78 (± 0.16)	34.89 (± 0.37)	1.07 (± 0.12)	39.65 (± 0.20)	49.67 (± 0.33)	39.79 (± 0.34)	89.46 (± 0.85)	1.24 (± 0.20)	50.01 (± 0.31)
0.30	16.96 (± 0.15)	15.74 (± 0.11)	32.70 (± 0.31)	1.07 (± 0.11)	41.90 (± 0.39)	37.91 (± 0.27)	36.67 (± 0.31)	74.58 (± 0.65)	1.03 (± 0.14)	61.58 (± 0.28)

Values are mean of three determinations.

Values in parenthesis are standard deviation.

Values of Chl.a, Chl.b, Total Chl and Carotenoids are expressed in mg.100g⁻¹ fresh weight.