

Effect of Growth Regulators on Parthenocarpic Fruit Development in Tomato and Pepper Grown in Greenhouse

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ABSTRACT :

Tomato (*Lycopersicon esculentum* Mill.) cv. "Sonatin" and pepper (*Capsicum annum* L.) cv. "Yolo Wonder" were grown in a greenhouse during winter and spring. One day before anthesis flowers were emasculated and sprayed with PCA, IAA, and NAA at a concentration of 50 ppm. PCA was more effective in inducing parthenocarpic fruits than either NAA or IA for both tomato and pepper. Tomato fruits produced from PCA treated plants have larger dimensions and higher fresh weight, while pepper fruits produced from PCA have thicker peel, heavier fresh weight, and higher dry weight than IAA or NAA treatments.

Key words : Development, Greenhouse, Growth regulator, Parthenocarpic.

INTRODUCTION

Production of tomato and pepper during winter in greenhouses has increased drastically in Iraq. The effect of exogenous growth regulators on parthenocarpic fruit production was studied by many workers. Gustafson (1936) found that hormone sprays (IAA and IBA) enhanced parthenocarpic fruit development in tomato, cucumber, and squash. Wong (1938) found that NAA is effective in producing

parthenocarpic fruits in pepper, cucumber, and watermelon. Zalik, et. al. (1951) treated tomato flowers with para-chlorophenoxy acetic acid (PCA) produced parthenocarpic fruits. Matlob and Kelly (1974, 1975) found that PCA at a concentration of 50 ppm was more effective than IAA and NAA in producing parthenocarpic fruits of cucumber and snake cucumber. Monteiro (1986) found that high percentage of parthenocarpic fruits was produced in tomato plants grown in an unheated greenhouse during winter by using 2, chloro, 4, phenoxiacetic acid and gibberellic acid. Silveira and Taborda (1986) found that gibberellic acid, 2-naphthoxy acetic acid and 2-4-D were effective in producing parthenocarpic fruit in pepper.

The objective of this work was to study the effect of some growth regulators on production of parthenocarpic in tomato and pepper grown in greenhouse in order to increase the percentage of fruit set.

MATERIALS AND METHODS

Experiments were conducted in 20 x 6 m greenhouse unit, Horticulture Dept., College of Agriculture and Forestry, Mosul University during 1979-1980 and 1987-1988 growing seasons. Tomato cv. "Sonatin" and Pepper cv. "Yolo Wonder" were used in the experiment. The date of planting was Nov. 1 st. for both crops. Four treatments were applied to tomato and pepper plants (1) control, (2) 50 ppm Indole Acetic Acid (IAA), (3) 50 ppm Naphthalene Acetic Acid (NAA), (4) 50 ppm Para-Chloro Phenoxy Acetic Acid (PCA). Ten plants were used in each treatment in randomized complete block design with four replicates. The plot size was 2.5 m².

Flowers were emasculated one day before anthesis during a period between Dec. - Feb. and sprayed with hand

sprayer untill drip-off point. A surfactant Tween - 80 at a concentration of 0.1 % were added to all treatments including control. Percentage of fruit set were calculated 2 weeks from treatment time, and ripening fruits were brought to the laboratory for determination of fruit weight, fruit dimensions (length and width), and dry weight besides peel thickness for pepper fruits. The data was subjected to statistical analysis using Duncants Multiple Range Test at 5% level (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Tomato flowers treated with PCA gave the highest percentage of parthenocarpic fruits (77.7%) which differ significantly from other treatments (Table 1). Flowers treated with NAA gave 36.7% parthenocarpic fruits, while untreated flowers gave 20.7% and those treated with IAA gavethe lowest percentage of parthencarpic fruits (4.2%).

Pepper flowers treated with PCA gave the highest percentage of parthenocarpic fruits which differs significantly from other tretments. Application of IAA and NAA gave the lowest percentage of parthenocarpic fruits (Table 1).

It is found that PCA was more effective in inducing parthenocarpic fruits in tomato and pepper grown in the greenhouse during winter period where day length was short and light intensity was low. This result is in agreement with those reported by Zalik, et. al. (1951), Matlob and Kelly (1974, 1975), Mann and Minges (1949) in which PCA was effective in inducing parthenocarpic fruits in tomato, cucumber, and snake cucumber.

A cross section in tomato fruit treated with growth

Table 1. Effect of growth regulators application on induction of parthenocarpic fruits of tomato cv. Sonatin and pepper cv. Yolo Wonder grown in the greenhouse*.

Crop	Treatment	No. of flowers	% Parthenocarpic fruits
Tomato	50 ppm IAA	22	4.2 d
	50 ppm NAA	24	36.7 b
	50 ppm PCA	28	77.7 a
	Control	27	20.7 c
Pepper	50 ppm IAA	39	17.3 c
	50 ppm NAA	34	7.8 c
	50 ppm PCA	44	58.8 a
	Control	17	30.8 b

* Means followed by same letter(s) are not significantly different using Duncants Multiple Range Test at 5 % level.

regulators showed that fruit shape was similar to the normal fruit except that the locules were empty from seeds or there are traces of seeds inside. Parthenocarpic pepper fruits were similar to the normal fruit except that there were traces of seeds in the fruit core (Figure 1). Tomato fruit dimensions showed that fruits produced from PCA treatment were longer and wider than fruits produced from other treatment. Tomato fruits from PCA treatment were heavier in weight than other treatment followed by IAA, NAA, and control which gave the lowest fruit weight. Significant differences in fresh weight was recorded between treatments, however, there was no significant differences in tomato fruit dry weight among the treatments used (Table 2).

Pepper fruit produced from IAA were significantly shorter in length than other treatments. There was no significant differences in fruit width between treatments. PCA treatment gave thicker fruit peel than other treatments with significant differences between them. PCA treatment gave higher fruit weight, while IAA treatment gave significantly lower fruit weight. There was no significant differences in fruit weight between NAA and the control. PCA and IAA treatment gave the highest percentage of dry weight of pepper fruit, while the control treatment gave the lowest percentage of fruit dry weight (Table 3).

The present study revealed that PCA treatment was more effective in producing parthenocarpic fruits in tomato and pepper than both NAA and IAA, and these fruits were larger and heavier in weight. It is thus possible that spraying tomato and pepper flowers at anthesis stage with 50 ppm PCA may increase in fruit set and yield when these plants are grown in greenhouse during winter and early spring, when temperature and light intensity limit normal fruit development.

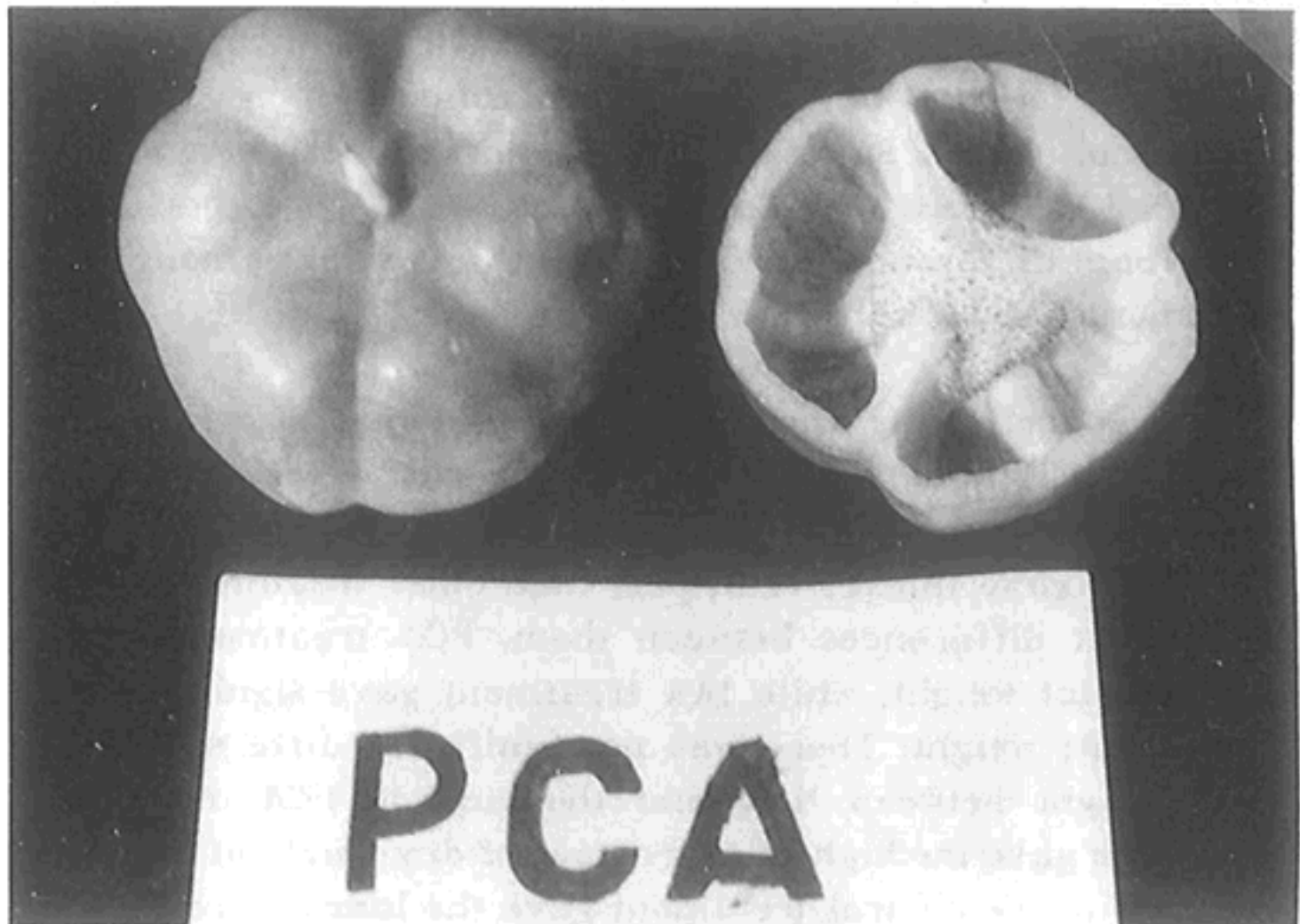


Fig. 1 : Cross section in pepper fruit cv. Yolo Wonder showing traces of seeds in the fruit core in response to 50 ppm PCA.

Table 2. Effect of growth regulators application on fruit size, weight, and percent dry weight in tomato fruit cv. Sonatin*.

Treatment	Length (cm)	Width (cm)	Fresh Weight (g)	% Dry Weight
50 ppm IAA	3.78 b	4.13 c	53.46 b	6.0
50 ppm NAA	3.22 c	3.78 c	47.98 c	5.5
50 ppm PCA	4.68 a	5.38 a	90.15 a	5.8
Control	4.20 b	4.75 b	32.52 d	5.8
				n.s.

* Means followed by the same letter(s) are not significantly different using Duncan's Multiple Range Test at 5 % level.

Table 3. Effect of growth regulators application on fruit size, peel thickness, weight, and percent dry weight in pepper fruit cv. Yolo Wonder*.

Treatment	Length (cm)	Width (cm)	Peel Thickness (mm)	Weight (g)	% Dry Weight
50 ppm IAA	3.58 b	4.46	3.5 a	29.20 c	5.9 a
50 ppm NAA	6.12 a	5.70	3.0 b	46.42 b	5.6 b
50 ppm PCA	5.92 a	5.84	5.0 a	82.48 a	5.9 a
Control	7.08 a	5.50	3.5 a	69.80 b	5.1 c
		n.s.			

* Means followed by same letter(s) are not significantly different using Duncan's Multiple Range Test at 5 % level.

REFERENCES

- Gustafson, F.G. 1936. Inducement of fruit development by growth promoting chemicals. Proc. Natl. Acad. Sci. U.S. (22) : 628 - 636.
- Mann, L.K. and P.A. Minges. 1949. Experiments on setting fruit with growth regulating substances on field grown tomatoes in California. Hilgardia 19 No. 10.
- Matlob, A.N. and W.C. Kelly. 1974. Induction of parthenocarpic fruits in snake cucumber (Cucumis melo var. flexuosus Naud.) by growth regulators. Mesopt. J. Agric. (9) : 103 - 109.
- Matlob, A.N. and W.C. Kelly. 1975. Growth regulators activity and parthenocarpic fruit production in snake melon and cucumber grown at high temperature. J. Amer. Soc. Hort. Sci. 100 (4) : 406 - 409.
- Monteiro, A.A. 1986. The effect of auxin, gibberellin and vibrator on greenhouse tomatoes fruit - setting and yield in mild winter climatic conditions. Acta Horticulturae (176) : 159 - 163.
- Steel, R.G.D. and J.H. Torrie. 1960. Principles and procedures of statistics. McGraw Hill Inc. pp. 481.
- Silveira, H.L. and M.L. Taborda, 1986. Effects of growth regulators for fruit setting on pepper production. Acta Horticulturae (191) : 189 - 197.
- Wong, C.Y. 1938. Induced parthenocarpic of watermelon, cucumber, and pepper by the use of growth promoting substances. Proc. Amer. Soc. Hort. Sci. (36) : 632 - 636.
- Zalik, S., G.A. Hobbs, and A.C. Leopold. 1951. Parthenocarpic in tomato induced by para-chlorophenoxy acetic acid applied to several loci. Proc. Amer. Soc. Hort. Sci. (58) : 201 - 207.

تأثير الرش بمنظمات النمو على إنتاج الثمار العذرية في الطماطة والفلفل المزروعة في البيت الزجاجي.

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الخلاصة

زرعت الطماطة صنف سوناتين والفلفل صنف يلوندر في البيت الزجاجي خلال فصلي الشتاء والربيع . لقد ازيلت الاعضاء الذكورية من الازهار قبل يوم تفتحها ثم رشت بمنظمات النمو وهي بارا - كلوروفينوكسي حامض الخليك واندول حامض الخليك ونفثالين حامض الخليك بتركيز ٥٠ جزء بالمليون . لقد وجد نتيجة الدارسة بان مادة بارا-كلوروفينوكسي حامض الخليك هي اكثر فعالية في انتاج الثمار العذرية من مادة نفثالين حامض الخليك او مادة اندول حامض الخليك في كل من الطماطة والفلفل . ان ثمار الطماطة الناتجة من المعاملة بمادة بارا - كلوروفينوكسي حامض الخليك كانت اكبر حجما واكثر وزنا . اما ثمار الفلفل الناتجة من نفس المعاملة فكانت هي ايضا ذات قشره اكثر ثخنا واكثر وزنا ووزنها الجاف عالي مقارنه مع بقية المعاملات الاخرى المستعملة في التجربه .

كلمات مفتاحية : البيت الزجاجي ، الثمار العذرية ، منظمات النمو ، النمو .