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Effect of foliar application of growth regulators (GA_3 and Ethereal) on growth, sex expression and yield of summer squash plants (*Cucurbita peop* L.) under plastic house condition

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Abstract: Two testing were load out through winter season of 2012/2013 and 2013/2014 at the experimental terminal of the National Research Centre at Nubaria zone, (North Egypt) to survey the reply of squash plants (*Cucurbita peop* L.) to foliar exercise of several bio-regulators (GA_3) at several concentrations (15, 30, 45 and 60 mg/L) or Ethereal at the levels of (150, 200 and 250 mg/L) and foliar spraying with water (control) to the effect of impact plant growth sex expression, proportion of fruit set, fruits yield and nutritional supplement of squash fruits c.v. Eskandarani. These processing were laid out in whole randomize styling disposition with three replications. The concise outcome gained from this field research that, mounting the concentrations of growth regulators (GA_3 or Ethereal) fulfilled tallest plant, highest number of leaves and branches, heaviest fresh and dry weight of leaves, branches, leaf area /plant and fruit set percentage as well as total yield and highest values of the percentage of N, protein, dry matter, TSS and vitamin C (mg/100g F.W.) in squash fruit tissues. However, foliar application of Ethereal at high level (150 mg/L) produced the elevated number of female flowers compared all treatments and control.

Key words: squash- GA_3- Ethereal- growth - sex expression- fruit set, total yield.

Introduction

Summer squash (*Cucurbita pepo* L.) is one of the most substantial Cucurbitaceae crops. This prominence arrive from employ it as a feed for human, extension to distinct medical aim[1].

Summer squash generally display more male flowers and few female flowers. This will reason lowering of its fruit yield. Growth regulators are dignify as one of the most substantial treatments, applied nowadays in farming, which in maximum status amend the plant growth and the following fruiting. They are utilized to catalyze seed germination, vegetative growth, flowering and fruiting in several vegetable crops expressed as gibberellins and Auxin. Available determination confirm that best yield can be accomplished by utilize different concentrations of growth regulators[2]. The sex expression of *cucurbita pepo* is resolved by genetics as well as ambience (e.g. photoperiod, temperature etc.). Change from vegetative growth to obstetric stages is a convention operation regulated by many operators, and can be affected by application of plant growth regulators. Growth regulators can change the sex ratio and series if utilized at the two-or four-leaf stage, which is the ticklish stage at which the extinction or build up of either sex is potential[3]. Gibberellins are the farthest exceedingly applied and confirmed growth materials in horticulture. Seed soaking with 550 ppm GA_3 for 12 hrs improved the number of leaves per plant and the highest fruit set % was gained when GA_3 was utilized at 70

ppm in gourd[4.] Similarly, the application of GA_3 at 85 ppm exhibit significant action on days to first male flower (34.7) in gourd [5] and elaborate that usage of GA_3 at 25 and 40 ppm reduced the number of days for fruit set %. Also, application of GA_3 at 40 ppm presents the maximum fruit diameter, fruit weight and it was lowest with GA_3 at (85 ppm). Application of GA_3 at (25 mgl-1) catalyzes the protraction of creep length in summer squash. Similarly, the application of GA_3 (25 mgl) at 2-4 whole leaf stage fulfill in the more vine length as compared to control in gourd [6.] However, [7,8] elaborate that GA_3 at 85 mgl-1 exhibit significant action on days to first male flower in gourd. Moreover, gibberellins play a master function in varied growth operation inclusive seed evolution, organ protraction, senescence and control of flowering period of squash[9]. However, [3] communicated that implementation of GA_3 at 25 ppm registered utmost number fruits per plants (15.8). Also, [10] establish that number of female flowers was invariably affected by application of GA_3. Furthermore, [11] necessitated that splashed with GA_3 at 25 ppm in four leaf stage at espalier mode could be a appropriate treatment for elevated growth and yield of curative pumpkin.

Ethephon, (2-chloethyl phosphonic acid) an ethylene-realizing synthesis, can stimulate leaf senescence as well as offspring of interacting oxygen genders, which in turn leads to cell dying [12]. On the other hand, [13] conveyed that the seedlings of cucumber squirt Ethereal at (400 mgl-1) during four to six leaf stage significantly increased number of female flowers per plant (35.23) and diminutive sex ratio (3.69) compared to control (19.8 and 224.5, respectively). In the same time, application of Ethereal at (400 ppm) in cucumber was found to be excellent with reverence to yield with extreme number of fruits per plant and total fruit yield. However, [14] they reported that used ethereal treatments to the plants at 3rd-4th proper leaf stages where as auxin applications were made when female flowers show and posterior periodic at 7 day- periods. Also, results found that all treatments of Ethereal positively influenced number of female flowers and increased from 8.6 to 10.2. Although, the femaleness proportion of squash and another monocots cucurbit crops are fundamentally display to genetic factors, those flowering practice may be highly diverse under various environmental status. Exogenous employment with ethylene- liberation synthesis like Ethereal or ethephon is through the growth regulator which could be applied in stimulate the femaleness in cucurbit crops, with a level from 100 to 500 mg/L as reported by [15]. Plentiful Scholars had notify that the proportion of female to male flowers in cucurbit plants is worthy and very substantial sign ago total fruit yield reckon onto this ratio [15,16,17.] However, [18] suggested that the favorable effect of squash seed soaking in garlic extract or sprinkle the seedlings with Ethereal in early stage might due to promote root growth during germination and early increasing period, which reflected on strength shoot growth consequently increasing sex ratio “female to male flowers ". Moreover, [19] reported that sprinkle squash seedlings by 250 ppm Ethereal at 1-2 true leaf periods catalyze plant growth, increased female flowers and thereafter improve fruit produce and its goodness. Furthermore, [11] propose that spraying of Ethereal at (100, 200 and 300 mgl−1), significantly reinforce the yield by increasing the female flower and decreased sex ratio. In addition, [20] found that supplement of highest level of gibberellins or Etherel (100 ppm) acquired the highest amount of onion plant growth, total yield and its nutritional supplement account of bulb tissues as well as improving bulb growth advancement such as cytokinins and gibberellins.

Since very small acquaintance is obtainable on the effect of growth regulators (Gibberellins or Ethereal) on growth, sex expression and yield of summer squash plants, the present fulfillment was endeavor to discover convenient growth regulators for increasing the yield possibility and also quality of summer squash.

Materials and Methods

Two experiments were conducted at Experimental Station of National Research Centre at Nubaria region, North Egypt under plastic house during of two successive seasons 2012/2013 and 2013/2014 under newly reclaimed sandy lands to study the effect of foliar spraying of some concentrations of bio-regulators (GA_3 and Ethereal) on the vegetative growth, sex expression, total yield and its nutrition values of fruit tissues of squash plants. Physical and chemical properties of the soil are presented in Table (1). All agricultural practices for summer squash crop production under plastic house were carried out as recommended by Egyptian Ministry of Agriculture.

Table 1: Physical and chemical properties of the experimental soil.

Physical properties							
Sand	**Clay**	**Silt**	**Texture**	**F.C. %**	**W.P. %**		
90.08	9.26	0.66	Sandy	16.57	5.25		
Chemical analysis							
EC	**pH**	**Meq/ L**					
1.7	8.2	Ca	Mg	Na	K	HCo_3	Cl
		7.02	0.527	0.982	0.31	1.30	0.566

Drip irrigation system was used. cv Eskandarani squash seeds were sown on ridges of 1.5 m width, 4 m length on one side of ridge and 30 cm apart. The treatments were arranged in a complete randomize design arrangement with three replications. Where, the growth promoter of GA_3 at levels of (15, 30, 45 and 60 mg/L) and Ethereal at levels of (150, 200 and 250 mg/L). Spraying was conducted three times; first one was 20 days after planting and then every 15 days for the second and third spray. Spraying was applied in early morning. Date of sowing was June, 1st in both growing seasons.

Experimental measurements:

Five plants were selected randomly from each experimental unit to measure: vegetative growth characteristics: plant height (cm), number of leaves and branches/plant, and leaf area/plant as well as fresh and dry weight (g) of plant.

Flowering characteristics: A random sample of three plants from each treatment was labeled. Number of staminate and distillate flowers were counted all over the flowering and fruiting period and the sex ratio was recorded by dividing the average number of staminate by distillate flowers. The percentage of fruit set was estimated fruit set per cent was calculated from the number of fruits to the number of female flowers produced per plant as follows:

$$\text{Fruit set (\%)} = \frac{\text{No. of fruits/ plant}}{\text{No. of female flowers/ plant}} \times 100$$

Sex ratio: It was calculated according to the following equation:

$$\text{Sex ratio} = \frac{\text{No. of female flowers}}{\text{No. of male flowers}}$$

Total fruits yield: Number and weight of fruits per plant and total fruits weight per m^2 as well as average fruit weight (g) were estimated. In addition, fruits contents of N were determined using the micro-kjeldahl method according to [21]. Dry matter of fruit tissues was determined according the method described by [22]. Also, crude protein was calculated according to [23] using the following equation. Crude protein = total nitrogen X 6.25. In addition, in fresh fruits, a hand refract meter and the method of [23] were used for the total soluble solids and vitamin C determinations, respectively. The obtained data of experiments were subjected to the statistically analysis of variance procedure and means were compared using the LSD method at 5% level of significance according to [24.] The combined analysis of the data in both seasons was used, since the same trend of the result was obtained.

Results and Discussion

Growth characters:

Table (2) clearly showed that, (average of 2013 and 2014 seasons) growth regulators at different levels give rise to significantly effectiveness on plant growth characters of squash plants liken untreated plants (control). However, increasing concentration of growth regulators (GA_3 or ethereal) performed in the highest plant length which had the heaviest number of leaves and branches as well as the biggest fresh and dry weight

of leaves, branches and leaf area /plant. Moreover, the highest squash plant growth account registered with that plant which received high GA_3 level (60 mg/L) approach all levels of

Table (2): Effect of GA_3 and ethereal levels on vegetative growth of squash plants under plastic house (combined data of two seasons).

Treatments	Plant length (cm)	Number of		Fresh weight (g)		dry weight (g)		Leaf area (cm^2)
		Branches	Leaves	Branches	Leaves	Branches	Leaves	
GA 15 Mg/L	32.64*	2.35*	12.45*	45.39*	167.04*	15.82*	43.63	380.62*
GA 30 mg/L	36.17*	2.67*	15.42*	58.71*	175.44*	18.70*	52.95*	385.07*
GA 45 mg/L	40.24*	2.86*	16.08*	65.35*	204.60*	20.99*	58.58*	395.50*
GA 60 mg/L	45.30**	2.95**	18.00**	70.18**	212.00**	23.36**	54.33*	399.60**
Ethereal 150 mg/L	32.22*	2.12*	13.55*	55.75*	169.31*	18.04*	43.75	348.21
Ethereal 200 mg/L	37.54*	2.19*	14.38*	61.14*	187.07*	19.61*	56.64*	354.65*
Ethereal 250 mg/L	39.30*	2.24*	14.74*	68.01*	195.30*	22.13*	58.90*	359.20*
Control	28.17	1.46	11.79	42.72	136.82	14.98	40.90	345.95
LSD at 5% level	0.30	0.07	0.16	0.35	6.99	0.46	7.00	2.90

GA_3 and other levels of ethereal. The advancement of growth by application of both growth regulation either in codes of increase squash plants growth characters has been intellect to be by increasing flexibility of the cell wall pursue by hydrolysis of starch to sugars which lowers the water prospect of cell, fulfill in the admittance of water to the cell causing protraction. These osmotic paying rejoinder under the effectiveness of gibberellins might have impute to increase in photosynthetic vigor, quickened translocation and performance of employ photosynthetic production, consequently perform in increased cell protraction and quick cell segmentation in the resurgent portion[25]. Also, might be due to its supplemental accessibility of GA in seed, which might have increased the concentration of amylase in the aleuronic tissues of seed for preferable transmutation of synthesis starch to simple sugar for providing power to growth [26.] The extreme increase in growth characters was observed with GA_3 at 60 mg/ L pursue by etherel at other concentrations and GA_3 at other levels. This could be attributed to the stimulatory effect of the plant growth regulators on cell partition and cell magnification, which lead to promoted leaf area and hence affected the growth and outgrowth. The increase in both leaf number and leaf area could be due to the effect of GA's on cell segmentation and cell magnification. The growths retardants are qualified for of redistribution of dry matter in the plant just like that fetch around amelioration in yield [27,32]. Furthermore, [20] on onion plant found that supplement of highest level of gibberellins and Ethereal (100 ppm) acquired highest prominence of growth preferment such as cytokinins and gibberellins and significantly improving plant growth characters.

Flowering characteristics of squash plants:

The effect of GA_3 and Ethereal levels on flowering characteristics of squash plants under plastic house (average of 2012 and 2013 seasons) are approaching in Table (3). Data show that flowering characteristics of squash plants under plastic house different in its restraint to growth regulation foliar sprays fountain and levels where the effect of growth regulation foliar sprays significantly increased fruit set proportion draw an analogy to control treatment. However, foliar spraying of GA_3 at 30 and 45 mg/L generated the highest fruit set percentage. Data observed that foliar spraying of GA_3 out weighed in its effects on Number of male flowers and the Sex ratio.

Table (3): Effect of GA_3 and ethereal levels on flowering characteristics of squash plants under plastic house (combined data of two seasons).

Treatments	No. of male flowers	No. of female flowers	Sex ratio	Fruit set percentage
GA 15 mg/L	8.33*	6.47	1.27*	0.90*
GA 30 mg/L	8.64*	6.55	1.31**	0.95**
GA 45 mg/L	8.79*	6.75	1.26*	0.95*
GA 60 mg/L	9.06**	7.46*	1.26*	0.92*
Ethereal 150 mg/L	7.84*	9.20**	0.87	0.78*
Ethereal 200 mg/L	7.45	9.00*	0.77	0.75*
Ethereal 250 mg/L	7.43	8.54*	0.84	0.92*
Control	8.12*	7.66*	1.07*	0.61
LSD at 5% level	0.19	0.29	0.08	0.06

Furthermore, all concentrations of Ethereal surpassed GA_3 in number of female flowers. On the other hand, foliar spraying of Ethereal at 150 mg/L generated the highest number of female flowers compared other treatments and control. Application of GA_3 persuaded the metabolic performance in plants due to promote vegetative growth [11.] Moreover, [18] suggested that the positive effect of squash seed soaking in garlic extract or spraying the seedlings with Ethereal in early stage might due to promoting root growth through germination and early growing stage, which reflected on intensity shoot growth consequently increasing sex ratio "female to male flowers ". Also, [19] reported that spraying of squash seedlings by 250 ppm Ethereal at 1-2 proper leaf stage catalyzed plant growth, improved female flowers ratio and then increased fruit offspring and its quality. In the same respect, [28] notified that spraying of gibberellins at (25, 50 and 75 mgl−1) during 4 leaf stage hade further significantly effects of vegetative growth and increased the flowering, So that promoted the seed yield than control and Ethereal treatments. Spraying of Ethereal at (100, 200 and 300 mgl−1), significantly promoted total yield by increasing female flowers and decreased the sex ratio.

Total yield and fruit quality:

Both growth regulators foliar sprays are plant hormones which are synthesized in plants and it is well known that the application of GA_3 increasing fruit yield and quality in many cucurbitaceous and other horticultural crops Table (4). The number of fruits per plant was significantly higher with the foliar spray of GA_3 at 60 mg/L followed by ethereal at same levels and the lowest fruit yield was recorded in control. However, total squash fruits yield as kg/ m^2 registered its heaviest values (1.883 kg/ m^2) with foliar application of ethereal at level of 250 mg/L. In descending order ethereal at level of 200 mg/L recorded (1.781 kg/ m^2) compared control treatment recorded (1.233 kg/m^2). The repayments of weight of fruits/plant as (g) pursue the same modality of change like that aforementioned above. The higher fruit yield was obtained as a conclusion of more number of hermaphrodite flowers per plant and superior vegetative growth [29,32]. Similar results were also reported by[5.]

Table (4): Effect of GA_3 and ethereal levels on fruit yield of squash plants under plastic house (combined data of two seasons).

Treatments	No. of fruits/plant	Weight of fruits /plant (g)	Total fruits yield /m^2 (kg)	Average fruit weight (g)
GA 15 Mg/L	6.04*	361.24	1.445	60.48
GA 30 mg/L	6.29*	390.52*	1.562	60.23
GA 45 mg/L	6.62*	394.69*	1.579	60.25
GA 60 mg/L	6.83*	408.94*	1.636	60.13
Ethereal 150 mg/L	7.22*	429.72*	1.719	60.16
Ethereal 200 mg/L	7.46*	445.23*	1.781	60.22
Ethereal 250 mg/L	7.64**	470.67**	1.883	60.28
Control	5.21	308.36	1.233	60.54
LSD at 5% level	0.35	25.38	0.55	N.S.

An increase in fruit yield in treated plants may over and above be assign to the purpose that plants continue physiologically extra vigorous to structure suitable absorb for the promote flowers and fruits, eventually superior to higher yield. The increase in fruit yield by foliar spray by both growth regulator materials is supposedly due to an increase in carbohydrate metabolism and piling up of carbohydrates [30,31,32]. In the same respect, [28] reported that spraying of Ethereal at (100, 200 and 300 mgl−1), significantly increased total yield by increasing the female flower and decreased the sex ratio.

Effect of GA_3 and ethereal levels on fruit chemical quality of squash:

Table (5): Effect of GA_3 and ethereal levels on fruit chemical quality of squash plants under plastic house (combined data of two seasons).

Treatments	%				Vitamin C (mg/100 g FW)
	N	Protein	TSS	Dry matter	
GA 15 Mg/L	0.60	3.61	3.12	4.00	11.83
GA 30 mg/L	0.60	3.68	3.19	4.05	12.00
GA 45 mg/L	0.62	3.76	3.20	4.20	12.22
GA 60 mg/L	0.64	3.83	3.15	4.50	12.96
Ethereal 150 mg/L	0.61	3.82	3.17	3.99	11.96
Ethereal 200 mg/L	0.63	3.86	3.19	4.05	12.90
Ethereal 250 mg/L	0.64	3.89	3.22	4.12	12.93
Control	0.60	3.61	3.11	4.00	11.54
LSD at 5% level	N.S.	N.S.	N.S.	NS	N.S.

Data recorded in Table (5) shows clearly that, the highest values of the percentage of N, protein, dry matter and TSS as well as vitamin C (mg/100g F.W.) in squash fruit tissues were gained by foliar spray of GO_3 and ethereal at high level compared to other treatments and control. However, the obtained data refined that, with increasing growth regulator levels their contents in squash fruit tissues advanced to reach the highest values. The statistical analysis of the obtained data discovers that, the differences within different foliar spraying of both growth regulator levels were recorded no significant repayment. Generally, in spite of the no significant response, but the best chemical nutritional values of squash fruits were uncover with high level of growth regulators [33].

References

1. Majeed, S. H. and M. J. Mahmoud, 1988. Herbs and plants in Popular Medical and Scientific Research. First publication. Drug and Drug Education Department. Biological Research Centre. Scientific Research Council.
2. Abdul, K. S. and A. A. K. Mohammed, 1986. Vegetable Physiology. Directorate of Book house of printing and publishing. Mosul. Iraq
3. Hossain D, MA Karim, M H R Pramanik, A A M. Rahman, 2006. Effect of gibberellic acid (GA3) on flowering and fruit development of bitter gourd (Momordica charantia L.) International Journal of Botany 2: 329–332.
4. Rajpalsingh, G, N.R Rajbir and S.S Dahiya, 2001. Responses of foliar application of growth regulators and nutrients in ber (*Zizyphus mauritiana* Lamk.) cv. Umran. Haryana J. Hort. Sci., 30(3&4): 161-164.
5. Dostogir, H, M. Abdul Karim, , H R Pramanik, A.A.M Rahman, 2006. Effect of gibberellic acid (GA3) on flowering and fruit development of bittergourd (*Momordica charantia* L.). Intl. J. Bot., 2 (3) : 329-332.
6. Arora S K, Pandta M L, K S. Baswana, 1985. Effect of growth regulators on flowering and fruiting of bottle gourd. Haryana Agricultural University Journal of Research., 25: 36-41
7. Yongan C., Z. Bingkui, Z. Enhui and Z. Zunlian, 2002. Control of Sex Expression in Summer Squash (*Cucurbita pepo* L.). Northwest Sci-Tech University of Agriculture and Forestry, Yangling Shaanxi, P.R.China, 712100
8. Pankaj G, Dhaka R S, M S. Fageria, 2005. Effect of plant growth regulators and water round melon. Haryana Agricultural University Journal of Research., 11: 485-489.
9. Ouzounidou, G., P. Papadopoulou, A. Giannakoula and I. Ilias, 2008. Plant growth regulators treatments modulate growth, physiology and quality characteristics of *Cucumis melo* L. plants. *Pak. J. Bot*., 40: 1185-1193.
10. Mohamed S.; A. Gholipouri and R.S. Sharifi, 2008. Tocopherol Accumulation and Floral Differentiation of Medicinal Pumpkin (*Cucurbıta pepo* L.) in Response to Plant Growth Regulators. Academic Pres.Not. Bot. Hort. Agrobot. Cluj 36 (1), 80-84.

11. Sure SH, H. Arooie and M. Azizi, 2012. Influence of plant Growth Regulators (PGRs) and Planting Method on Growth and Yield in Medicinal Pumpkin *(Cucurbita peop* var. *styriaca).*Not Sci Biol, 2012, 4(2):101-107.
12. Chen, H.J., Y.J. Tsai, W.S. Chen, G.J. Huang, S.S. Huang and Y.H. Lin, 2010. Ethephon-mediated effects on leaf senescence are affected by reduced glutathione and EGTA in sweet potato detached leaves. *Botanical Studies*, 51: 171-181.
13. Vadiger BG, BB Madalageri, MN Sheelavantar, 2001. Effect of ethrel and gibberellic acid on yield and quality of two cucumber varieties. Karnataka J Agric Sci 14:727-730.
14. Manacini, L, 1999. Effect of growth regulators on flower differentiation and yield in *cucurbita pepo* grows in protected cultivation. Acta Hort. (492) p. 265-272.
15. Mibus, H. and T. Tatlioglu, 2004. Molecular characterization and isolation of the *F/f* gene for femaleness in cucumber (*Cucumis sativus* L.). Theor. Appl. Genet., 109: 1669-1676.
16. Abd El-Fattah, M.A. and M.E. Sorial, 2000. Sex expression and productivity responses of summer squash to biofertilizer application under different nitrogen levels. Zagzig J. Agric. Res., 27: 255-281.
17. Jalal, M. M., 2000. Effect of some plant growth regulators on growth, sex expression and yield of (*Cucurbita pepo* L. and *Cucumis sativus*) M.Sc. Thesis. College. Agr. Sulaimania Univ. Iraq.
18. Glala A.A., E.E.H. Abd El-Samad, S.O. El-Abd and H.A. Obiadalla-Ali, 2012. Increasing Organic Production of Summer Squash by Modulating Plant Sex Ratio. Acta Hort. 933: 137-143.
19. Ezzo, M.I. A.A. Glala, S.A. Salah and Nadia M. Omer, 2012. Improving squash plant growth and yielding ability under organic fertilization condition. Australian Journal of Basic and Applied Sciences, 6(8): 527-578.
20. Nagwa, M.K. Hassan, Shafeek, M.R., Saleh, S.A. and Nadia H. M. EL-Greadly, 2013. Growth, yield and nutritional values of onion (*Allium cepa* L.) plants as affected by bio regulators and Vitamin E under newly reclaimed lands. Journal of Applied Sciences Research, 9(1): 795-803.
21. Cotteine, A.Verloo, M; Velghe, M.and Camerlynck,. 1982. Chemical analysis of plant and soil. Laboratory of Analytical and Agrochemistry state Univ. Ghent-Belgium.
22. Dubois, M., K.A. Gilles, J.K. Hamilton, P.A. Robors and F. Smith, 1959.Colorimetric method for determination of sugars and related substances. Analytical Chem., 28:350.
23. A.O.A.C., 1990. Official Method of Analysis, 15th Ed., Association of Official Analytical Chemists, Inc., USA.
24. Gomez, K.A. and A.A. Gomez, 1984. Statistical Producers for Agriculture Research. John Wiley and Sons Inc., 2nd (ed.) New York, U.S.A.
25. Sargent, J. A., 1965. The penetration of growth regulators into leaves. Ann. Rev. Pl. Physiol.,16: 1-12.
26. Ram Asrey, Singh, G. N., Shukla, H. S. and Rajbir Singh, 2001, Effect of seed soaking with Gibberellic acid on growth and fruiting of muskmelon (*Cucumis melo* L.). Haryana J.Hort. Sci., 30(3&4): 277-278.
27. Chandrababu , R., Manian, K., Nagarajan, M. and Ramachandran, T.K., 1995, Effect of mepiquat chloride on growth and yield of groundnut. Madras Agric. J., 82 (3):229-230.
28. Sure SH, H. Arooie and M. Azizi 2013. Effect of GA3 and Ehtephon on sex expression and oil yield in medicinal pumpkin *(Cucurbita peop* var. styriaca*).*
29. Sidhu, A. S., Pandita, M.L. and Hooda, R. S., 1982, Effect of growth regulators on growth, flowering, yield and quality of muskmelon. Haryana Agric. Univ. J. Res., 12(2): 231-235.
30. Mishra, G.M., B. Prasad, and S. C., Sinha, 1972, Effect of plant growth substances on growth, sex expression and yield of bottle gourd. *Proceedings of Third International Symposium on Subtropical and Tropical Horticulture*, pp. 199-207.
31. Ghoname, A.A.; AM El-Bassiony, GS Riad and MMH Abd El-Baky 2007. Reducing onion bulbs flaking and increasing bulb yield and quality by potassium and calcium application. Australian Journal of Basic and Applied Science, 1 (4), 610-618.
32. Shafeek, M.R., 1995. Response of pepper growth and yield to some cultural treatments under plastic house. phD. Faculty of Agriculture Al-Azhar University. Pp 123.
33. El-Tohamy, W.A., H.M. El-Abagy, M.A. Badr, S.D. Abou-Hussein, Y.I. Helmy and M.R.Shafeek, 2015. Effects of Yeast Extract and GA3 on Water Status, Growth, Productivity and Quality of Sweet Potato Grown in Sandy Soils. International Journal of Environment, 4 (4): 256-261.

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