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EFFECT OF POMEGRANATE PLANT RESIDUES EXTRACTS ON THE GROWTH OF SOME ORNAMENTAL PLANTS

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Abstract:

A factorial experiment applied according to randomized complete block design (RCBD) and with three replications during the winter season 2021-2022 in the greenhouse of the College of Science, University of Babylon in a soil with a mixed tissue to study the effect of extracts of pomegranate plant residues on the growth of some ornamental plants (*Calendula officinalis* L., *Tagetes erecta* L.and , *Althaea rosea* L.) were studied. The results indicated a different in the effect of pomegranate peel extract between stimulating and inhibiting the growth of some ornamental plants. The extract showed an inhibitory effect on all growth characteristics of *Calendula officinalis* plants. As for the *Tagetes erecta* plant, it showed an increase in root length and a slight increase in the number of leaves. As for the length of the leaf, it did not. The extract has no significant effect, while we note a stimulus to growth in the *Althaea rosea* plant when the same treatment

As for the effect of the plant extract on the anatomical characteristics of the *Calendula officinalis* and *Tagetes erecta* leaf, it gave the highest rate in the dimensions of normal epidermal cells and on both the adaxial and abaxial surfaces under the effect of the treatment, except for the abaxial surface of the *Tagetes erecta* leaf. The treatment gave the lowest rate of stomata length compared to the control plant. Treating the *Althaea rosea* plant with the plant extract results in an increase or decrease in the dimensions of the epidermal cells and their stomata on both the adaxial and abaxial surfaces

Keywords: pomegranate plant residues extracts, Growth, *Calendula officinalis* L, *Tagetes erecta* L, *Althaea rosea* L. surface anatomy

INTRODUCTION

The pomegranate (*Punica grantum* L.) is a deciduous summer fruit that belongs to the pomegranate family Punicaceae, which contains one genus, *Punica*, and two species (hash,2004). As for the nature of the plant, it is shrubs up to 1 meter in length and has opposite leaves with flat edges, oblong to elliptical, the fruit with a thick leathery cover of reddish-brown to yellowish color and divided into 7-8 divisions (Al-Husseini, 1992). At present, it is widely cultivated in Asia, Europe, North America, South America, Africa and Australia.(Holland *et al.*,2009).

The pomegranate plant is one of the important medicinal plants (Taffa, 2013), and recent studies have proven that the plant contains chemical compounds. The outer rind of the pomegranate contains tannic acid, an astringent substance whose powder is used as an anti-diarrhea. Alkaloids and 3 types of phenolic compounds were extracted from pomegranate peels, which are Tannic acid, Gallic acid and Ellagic acid (Obeid *et al.*,2011). The pomegranate peel also contains percentages of the mineral elements calcium, potassium, sodium, phosphorous, iron, zinc, manganese and copper, as their concentration reached 342, 48.64, 64.63, 118.30, 6.35, 0.93, 0.78 and 0.64 mg per 100 gm, respectively (Ranjitha *et al* .,2018a). In addition to some vitamins, which included (Thiamine) B1, (Riboflavin) B2, (L-Ascorbic acid) C, (α-Tochoferol) E and (Retinol) A. (Rowayshed *et al.*, 2013). Ornamental plants are often potted plants used to decorate balconies, windows, and basins, and because of the importance of ornamental plants in economically, and the increased demand for them in recent times and their acquisition by many, it has become necessary to spread them and improve their vegetative and floral qualities, by paying attention to their own agricultural operations and finding natural alternatives to fertilization instead From traditional fertilizers and replacing them with natural materials and plant extracts, which are usually fairly inexpensive, and provide the plant with its needs of nutrients.

Plants differ in their contents of chemicals according to their types and stages of growth, and they differ in the amount of these substances released to the environment, whether to the soil or the air. The substances released to the soil and the air affect the germination and growth of other plants, whether a positive, encouraging or a negative effect (Said, 1995).

The role of allelopathic in agricultural systems has been evaluated through the effect of crop residues on other crops or in the bush, or the effect of bush residues on crops or bush (Leather, 1983). Several studies have confirmed that some plants have allelopathic effects on germination and growth, such as okra, green pepper, jet and others (Al-Asadi, 2007)

The results (Ali, 2001) showed that there is a significant effect of yeast extract on the vegetative growth and flowering characteristics of *Calendula officinals*, as well as the increase in the content of the leaves of nitrogen and phosphorous with an increase in the concentration of Yeast in solution. Al-Rubaie (2003) explained that spraying *Freesia refricta* bulbs with licorice root extract at a concentration of 2.5 g\ L resulted in the largest number of leaves, leaf area and leaf content of total chlorophyll, in addition to giving the highest length and diameter of the flower stem. The research aims to study the effect of pomegranate peel residue extract on the growth of some ornamental species through the use of inexpensive materials that are not harmful to the environment and plants: are *Calendula officinalis* L., *Tagetes erecta* L., and *Althaea roseaL.*

MATERIAL AND METHODS

The experiment was conducted in the greenhouse of the Department of Life Sciences - College of Science, the University of Babylon in the winter season of 2021-2022 to know the effect of pomegranate extract residues on the germination of some ornamental plants For planting (plastic) with a diameter of 10 cm and a depth of 15 cm, and the sifted and air-dry agricultural soil was placed inside it to plant seeds of ornamental plants (*Calendula officinalis* L., *Tagetes erecta* L. and *Althaea rosea* L.) at a rate of 5 seeds per pot and three replications per plant. Then the pots were irrigated with aqueous extract and this process was done once every two weeks, followed by watering with distilled water whenever needed. As for the control pots for each plant type, they were watered with distilled water only.

The aqueous extract was prepared by weighting 20 grams of pomegranate peels in 1000 ml of distilled water to get 20 g\L concentration. Then the filtered by three layers of cheesecloth(Mersie, and Singh ,1978), Then the data of three plants from each experimental unit were recorded randomly at the age of 60 days and the following characteristics were studied: Plant height (cm) , Root height(cm) , Fresh weight for plant(gm), dry weight for plant (cm), Leaf hight(cm), Leaf width(cm) and Number of leaves/plant. To prepare samples of the epidermis, the fresh samples were put in ethanol 50 %, then scrapped by the anatomical blade to get the upper and lower epidermis (Al-Musawi ,1979).

RESULTS AND DISCUSSIONS

The results are shown in Table (1) indicate the negative effect was evident in the *Calendula officinalis* plant treated with the plant extract, which gave the lowest rate in growth characteristics of plant length, root length, fresh weight, dry weight of the plant and leaf length and width (8.5 cm, 6.5 cm ، 1.36 gm 0.16 g, 8.8 cm and 1.9 cm respectively, compared to the control treatment, which gave the highest rate of plant length, root length, fresh weight, plant dry weight, and leaf length and width, which reached (9.3 cm, 9.1 cm, 2.5 gm, 0.35 gm , 10 cm and 2.6 cm) respectively.

As for the number of plant leaves, the treatment with plant extract did not differ from the control treatment, as it gave the same average number of leaves as it reached 7 leaves for each plant. The reason for this may be that the plant residues after their decomposition give allelopathic compounds, and these compounds move to the ocean depending on their quantity, survival period and biological activity, causing effects in the receiving plant such as stimulating or inhibiting germination and growth (Ballester, 1972).

Table (1) Effect of aqueous pomegranate peel residues extract on some growth parameters of *Calendula officinalis* plant

Treatments	D.W	pomegranate peel extract
Plant height	9.3	8.5
Root height	9.1	6.5
Fresh weight for plant	2.5	1.36
dry weight for plant	0.35	0.16
Leaf hight	10	8.8
Leaf width	2.6	1.9
Leaves number of plant	7	7

* C0: *Calendula officinalis*(control), C1: *Calendula officinalis* Plant treated with extract

The results presented in Table (2) indicate that the treatment of the *Tagetes erecta* plant with the plant extract led to an increase in root length at an average of 4.8 cm compared to the root length of the control plant at an average of 3.1 cm. The plants irrigated with distilled water gave the highest average of plant height, fresh weight, dry weight of the plant and leaf width of 5.5 cm, 0.24 g, 0.03 g and 1.26 cm, respectively, compared to the extract treatment which gave the lowest average plant height, fresh weight and dry weight of the plant and leaf width were 4.8 cm, 0.18 g, 0.02, and 0.86 cm, respectively, While the length of the plant leaf when treatment with plant extract did not differ from the control treatment, as it gave the same average leaf length, which was 1.56 cm.

The results of the study showed a slight increase in the number of leaves treated with the extract, at a rate of 8 leaves/plant, compared to the distil water treatment, which gave an average of 7 leaves/plant. The increase in root length may be due to the fact that allelopathic compounds may lose their toxicity or chemically transform into secondary compounds as a result of the washing process. This result agreement Kimber (1967) who found that the toxicity of the residues to wheat, some weeds and legumes decreased when decomposing by microorganisms as well as the washing process.

Table (2) Effect of aqueous pomegranate peel residues extract on some growth parameters of *Tagetes erecta* plant

Treatments	D.W	pomegranate peel extract
Plant height	5.5	4.8
Root height	3.1	4.5
Fresh weight for plant	0.24	0.18
dry weight for plant	0.03	0.02
Leaf hight	1.56	1.56
Leaf width	1.26	0.86
Leaves number of plant	7	8

* T0: ***Tagetes erecta*** (control), T1: ***Tagetes erecta*** (Plant treated with extract)

The results recorded in Table (3) showed that the irrigation treatments with pomegranate extract had a positive effect on the vegetative growth indicators (plant length, root length, plant fresh and dry weight, leaf length and width) at a rate of 5.1 cm, 16 cm, 0.93 g, 0.35 , 2.8 cm and 2.8 cm compared to the lowest rate of plants that were not treated with the aqueous extract (control), which gave 4 cm, 10.3 cm, 0.68 g, 0.16 cm, 2.2 cm and 2 cm, respectively.

There was no effect of the aqueous extract on the plant of the number of leaves, as the average number of leaves was 5 leaves/plant. This result is similar to that obtained by Youssef (2009) found that the aqueous extracts of a number of plant residues have an effect on the germination and growth of some crops, and that the effects of these extracts may be negative or positive on other plants.

Table (3) Effect of aqueous pomegranate peel residues extract on some growth parameters of *Althaea rosea* plant

Treatments	D.W	pomegranate peel extract
Plant height	4	5.1
Root height	10.3	16
Fresh weight for plant	0.68	0.93
dry weight for plant	0.16	0.35
Leaf hight	2.2	2.8
Leaf width	2	2.8
Leaves number of plant	5	5

* A0: *Althaea rosea* (control), A1: *Althaea rosea* (Plant treated with extract)

B- Surface anatomy of leaf

Table (4) shows the plants treated with the plant extract gave the highest average in the dimensions of the ordinary epidermal cells on the adaxial surface of the *Calendula officinalis* leaf of the length and width of the epidermal cells, the stomatal index, and the length and width of the stomata. 106.25, 58.75, 26, 31.25 and 23.75 µm respectively, while the control plant recorded the lowest average of length and width of ordinary epidermal cells for the same surface, stomata index, and stomata length and width, which were (81.2, 40, 13.3, 30 and 21.2) µm, respectively. Also found the abaxial surface of the *Calendula officinalis* leaf treated with the extract, it did not differ much from its Adaxial surface of ordinary epidermal cells dimensions, stomata length, width, and stomata index, which gave the highest rate in the characteristics of the mentioned cells compared to the control plant, whose cells gave the lowest rate in Table (4).

Table(4):-Mean values of leaf epidermis of the *Calendula officinalis* plant.

Treatments	Surface	Dimensions of epidermal cells		Dimensions of Stomata		Stomatal index
		Length (µm)	Width (µm)	Length (µm)	(Width µm)	
C0	Adaxial	81.2	40	30	21,2	13,3
	Abaxial	75	38.75	31.25	21.25	10.6
C1	Adaxial	106,25	58,57	31.25	23.75	26
	Abaxial	112.5	67.5	32.5	25	15.3

* C0: *Calendula officinalis*(cnntroll), C1: *Calendula officinalis* Plant treated with extract

The results of the experiment in Table (5) showed that treatment with aqueous extract gave the highest average in the dimensions of ordinary epidermal cells on both the Adaxial and Abaxial surfaces, except for the average stomata

length on the Abaxial surface of the leaf of the *Tagetes erecta* plant, which was (31.8) µm compared to the average stomata length for the control plant. Which gave the highest rate of 33.75 µm.

Table(5):-Mean values of leaf epidermis of the *Tagetes erecta* plant.

Treatments	Surface	Dimensions of epidermal cells		Dimensions of Stomata		Stomatal index
		Length (µm)	Width (µm)	Length (µm)	Width(µm)	
T0	Adaxial	92.5	60	32.5	18.12	17.2
	Abaxial	102.5	37.5	33.75	21.25	15.4
T1	Adaxial	100	61.25	33.75	21.25	21.2
	Abaxial	103.75	70	31.8	18.7	31.8

* T0: *Tagetes erecta* (control), T1: *Tagetes erecta* (Plant treated with extract)

The results of table (6) showed the differences in the dimensions of the studied cells of the *Althaea rosea* plant when treatment with plant extract in the width of the Adaxial epidermal cells and the length and width of the stomata decreased in the treated plants, except for the length of the epidermal cells, where the highest rate was recorded at 72.5 µm, and also the stomata index reached 23.8 for the mentioned surface.

It was also noted from the same table a reduction in the length of the ordinary epidermal cells of the Abaxial surface of the plant extract treated with the plant extract and the width of the stomata compared to the control plants, and the extract caused a slight increase in the stomata index and the stomata length for the same surface reached 28.4 and 27.5 µm respectively, while the width of the ordinary epidermal cells The extract showed no significant effect. The environmental and nutritional conditions during plant growth can influence cell differentiation, leading to anatomical and physiological adaptations(Júnior *et al.*,2013).

Table(6):-Mean values of leaf epidermis of the *Althaea rosea* plant.

Treatments	Surface	Dimensions of epidermal cells		Dimensions of Stomata		Stomatal index
		Length (µm)	Width (µm)	Length (µm)	Width(µm)	
A0	Adaxial	63.75	61.25	31.25	23.75	22
	Abaxial	83.75	43.75	24.5	21.25	21.2
A1	Adaxial	72.5	38.75	26.25	20	23.8
	Abaxial	56.25	43.75	27.5	20	28.4

* A0: ***Althaea rosea*** (control), A1: ***Althaea rosea*** Plant treated with extract

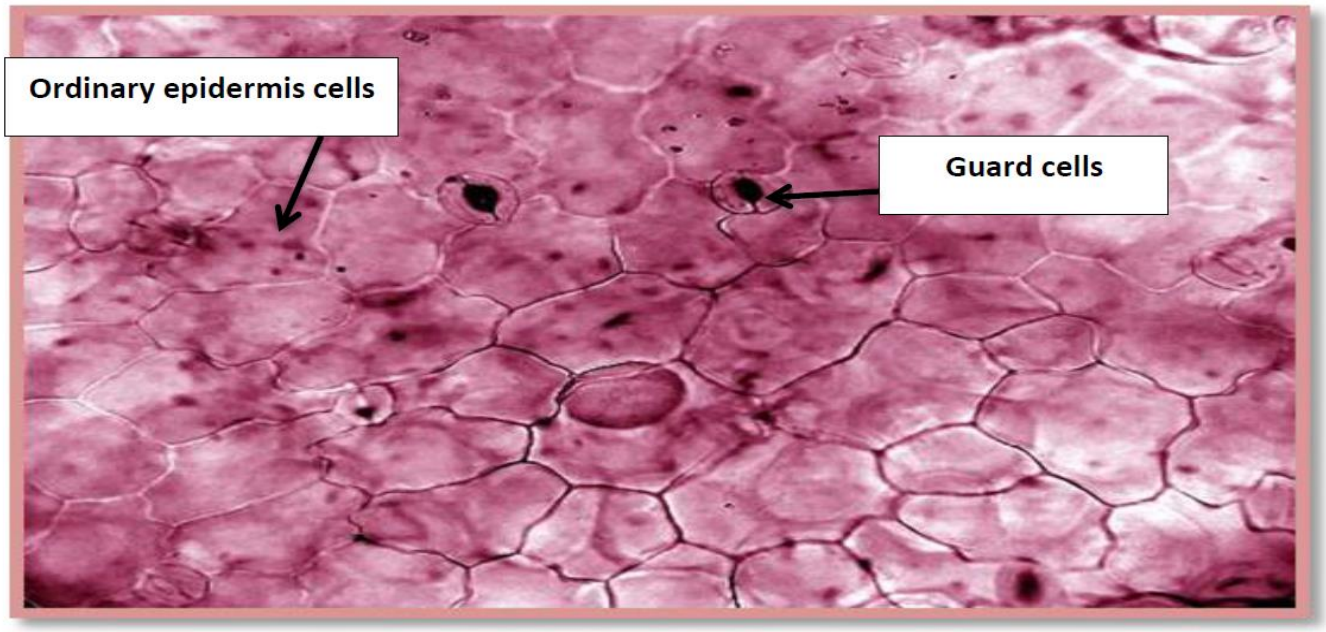

Fig. (1): Characteristics of epidermal cells and stomata complexes in the abaxial surface epidermis of a *Tagetes erecta* measured by 40X.

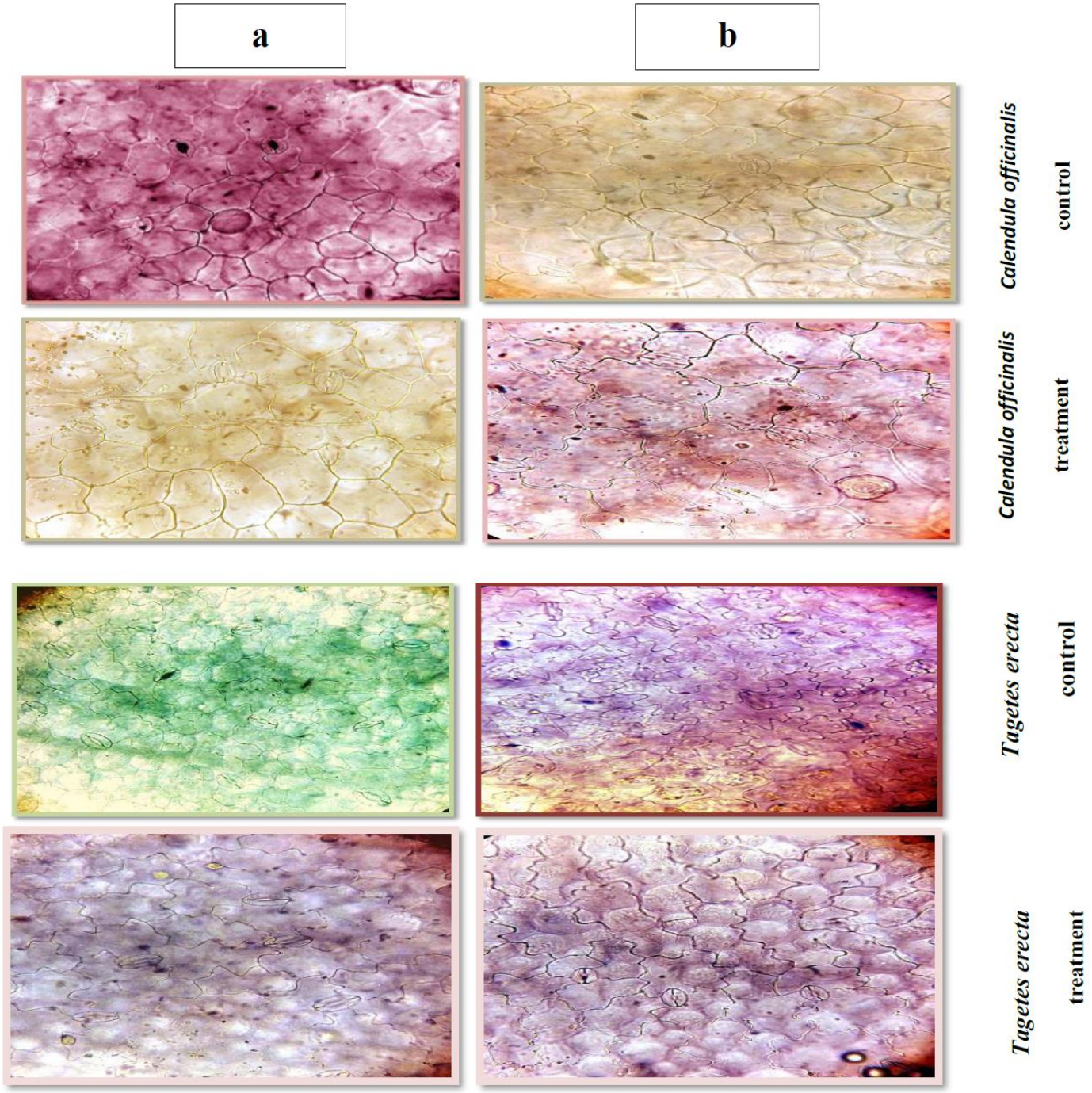

Fig.(2): Variations in epidermal cell characteristics and stomata complexes in the epidermis of *Calendula officinalis* and *Tagetes erecta* leaf under Light Microscope 40X . (a-Adaxial surface b-Abaxial surface).

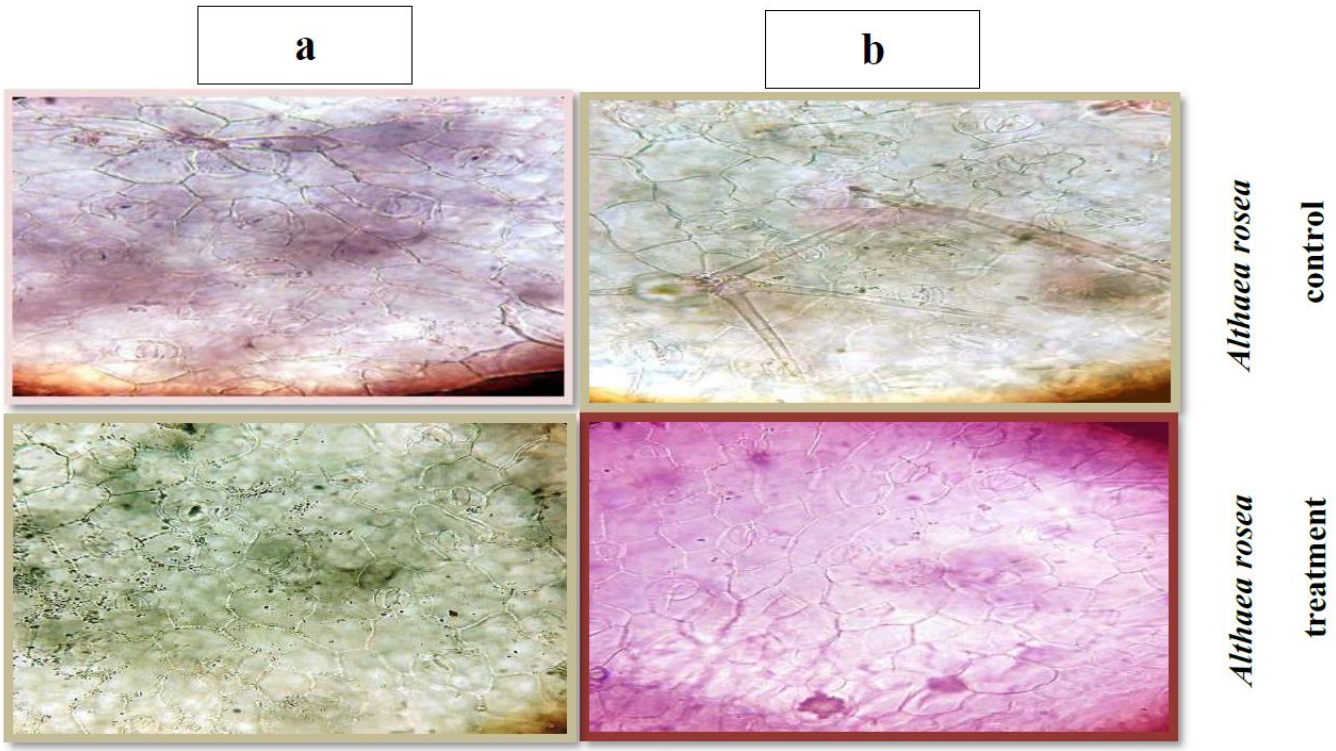

Fig.(3): Variations in epidermal cell characteristics and stomata complexes in the epidermis of *Althaea rosea* leaf under Light Microscope 40X . (a-Adaxial surface b-Abaxial surface).

CONCLUSIONS

1- *Althaea rosea* was the most resistant plant to extracts of pomegranate plant residues, and *Tagetes erecta* showed some resistance, followed by the *Calendula officinalis* plant, which was more sensitive than all.
2-The anatomical study of the leaf surface showed an increase in the dimensions of the ordinary epidermal cells and the stomata index and its dimensions in the *Calendula officinalis* plant and then the *Tagetes erecta* plant, except for the length of the stomata on the abaxial surface, As for the *Althaea rosea* plant, the dimensions of its cells varied between increase or decrease under the influence of the extract.

REFERENCES

1. Al-Asadi, Zainab Muhammad Yunus (2007). Molecular analysis of allelopathic stress of some rice cultivars.
2. Al-Husseini, Ayman. (1992). Among the treasures of folk medicine: Healing foods and medicinal plants, Ibn Sina Library, Cairo: 128 p.
3. Ali, A.F., 2001. Response of marigold (*Calendul officiualis L.)* plants to some rock phosphate source a and yeast. The fifth Arabian Horticulture Conference, Ismalia, Egypt, pp: 30-42.
4. Al-Musawi, A. H. 1979. A systematic study of the genus *Hyoscyamus* (Solanaceae). Ph.D. Thesis. Univ. of Reading. U.K. P.96.
5. Al-Rubaie, N. M. Alwan. (2003. The Effect of Spraying Nutrient Solution (Al-Nahrain) and Licorice Extract on Growth, Flowers and Flowering Age in Freesia, Master Thesis, College of Agriculture, University of Baghdad, Iraq, p. 86 Conference, Ismalia, Egypt, pp: 30-42 .
6. Ballester, A. (1972) . Alelopatia : Interaccion Quimica Entra Especies vegatales. Acta. Gen , Compost , 9:145-151.
7. Hahesh, Abdullah Hussein (2004). Effect of some treatments on the storage capacity of the Pomegranate Sun, cultivar Soleimani acid. Master's Thesis - College of Agriculture - University of Baghdad.
8. Holland, D., Hatib, K., and Bar-Ya'akov, I. (2009). "Pomegranate: botany, horticulture, breeding," in Horticultural Reveiws, ed J. Janick(Hoboken, NJ: John Wiley & Sons): 127–191.
9. Júnior S, Rodrigues M, Castro E.M, Bertolucci SKV and Pasqual M. Acta Scientiarum .(2013). 35(1): 65-72.
10. Kimber , R.W.L. (1967). Phytotoxicity from plant residues 1. The influnces of rotted wheat strow on seedling growth. Aust . J. Agric . Res. 18:361-374 .

11. Leather, G.R. (1983). Sun flower (*Helianthus annuus* L.) are Allelopathic to Weeds Sci. 31: 37-42.
12. Mersie, W,and Singh , M. (1978). Allelopathic effect of Parthenium hysterophorus L . Extract and Residue on some agronomic crops and weeds J.Chem. Ecol ., 13: 1739-1746.
13. Ranjitha, J., Bhuvaneshwari, G., and Jagadeesh, S. L. (2018b). Effect of Different Treatments on Quality of Nutri-Enriched Cookies Fortified with Pomegranate Peel Powder and Defatted Soybean Flour. Int. J Curr. Microbiol. App. Sci, 7(2): 3680-3688.
14. Rowayshed, G., Salama, A., Abul-Fadl, M., Akila-Hamza, S., and Mohamed, E. A. (2013). Nutritional and chemical evaluation for pomegranate (Punica granatum L.) fruit peel and seeds powders by products. Middle East Journal of Applied Sciences, 3(4): 169-179.
15. Obaid, Ali Ismail, Raed Muallaq and Nahi, Youssef Yassin, Wathiq Abdul Hussain and Haidar, Radi Maleh (2011). Isolation of phenols from some plants and study of their anti-cancer efficacy, Iraqi Center for Cancer and Medical Genetics Research - Al-Mustansiriya University 71-66.
16. Saeed, Salah Mohamed (1995). The Contrast of Life. University of Mosul. Dar Al-Kutub for Printing and Publishing.
17. Taffa, ErmiasT., Gurmessa, Chemedaf and Mariam, Sahile.(2013). In vivo Assay for Antagonistic Potentional of Fungal Isolate against Faba bean *(Botyrtisfabae*sard). Vol.(6).No.(3).Pp:183-189.
18. Youssef, Hala Mazhar Yaqoub. (2009). Allelopathic effort of some intertwined plants for cultivation and its effect on germination and some growth characteristics, Master Thesis, College of Science, University of Mosul.