EFFECT OF PHOSPHORUS AND POTASSIUM ON VASE LIFE AND FLORAL STEM CROSS SECTION STRUCTURE OF CARNATION PLANT *DIANTHUS CARYOPHYLLUS* L.

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ABSTRACT

This study was conducted at the department of horticulture –college of agriculture - Basrah university, to investigate the effect of phosphorus at 0, 100 and 200 mg P_2O_5 /l and potassium at 0,100 and 200 mg K_2O/l as a soil drainage on vase life and cross section structure of carnation plant *Dianthus caryophyllus* L. floral stem in a factorial experiment designed with RCBD on plants of eight months old in the lath house.

Results showed that Phosphorus at 100 or 200 mg P_2O_5/l and Potassium at 100 or 200mg K_2O/l increased vase life and the number of rows and thickness in xylem and Phloem tissues.

Keywords: carnation plant, chemical fertilization, phosphorus, potassium.

INTRODUCTION

Carnations *Dianthus caryophyllus* L. are perennial herbaceous flowering plants belong to Caryophyllaceae family and widely used in garden design. And for their wide range formed flowers, different growth habits, colors, sizes and its peculiar fragrance, which is an important source of aesthetic gratification for the human beings, this plant has been used not only used for its garden beauty but also has been commercialized for its cut flowers and they were considered to be one of the most popular cut flowers and commercially important in the world market ranking next only to rose, for their excellent keeping quality, ability to with stand long distance transportation and remarkable ability to rehydrate after continuous shipping.

Although potassium is the seventh most abundant element on earth, and is absorbed in plants in larger amounts than any other nutrient except N. potassium generally has received less attention than N and P in many crop production systems (Havlin *et. al.,* 1999; Mikkelsen, 2007).

Sharaf and El-Naggar (2003) found that spraying carnation plants with phosphorus at 100 or 200 mg P_2O5/l improved some flowering characteristics such as diameter and dry weight of flower. On the other
hand, potassium application was also reported to increase SSC (soluble solids concentration) in 'Thompson Seedless' (Feliziani *et al.,* 2013). And Bashir *et. al.,* (2016) indicated that the maximum floret diameter under P+K and stem length and spike length was significantly higher under P+K was under P+K in addition they found that K played a significant role in the floret development.

The cross section of *Dianthus caryophyllus* L. floral stem consists of epidermis which is a single layer of cells in numerous sizes, of rectangle and oval forms surrounded with a thick layer of Cuticle.

After the epidermis inward comes Chlorenchyma region which consists of two rows of cells, followed by the cortex, which consists of several rows of Parenchyma cells characterized of different forms and sizes with clear intercellular spaces. The thickness of cortex is about 176.00 – 186.67 micrometers under a magnification force (X 10) and the rows number is 6.

Then comes a thick layer of Sclerenchyma cells, of about 133.34 –* Part of Ph. D. thesis of the second author 160.00 micrometers in 7-8 rows then comes the Vascular bundle which consists of phloem of 42.67 micrometers thickness and the number of rows of cells is 8. Inward of phloem, xylem is located of 37.33 micrometers thickness and of 11cell rows.

The vascular bundles are cylindrical and consist of a continuous layer of circling xylem and phloem then comes a broad layer of Pith of about 32.00 - 42.67 micrometers thickness. The pith consists of Parenchyma cells of different sizes and forms contain intercellular spaces between them (plate 1).

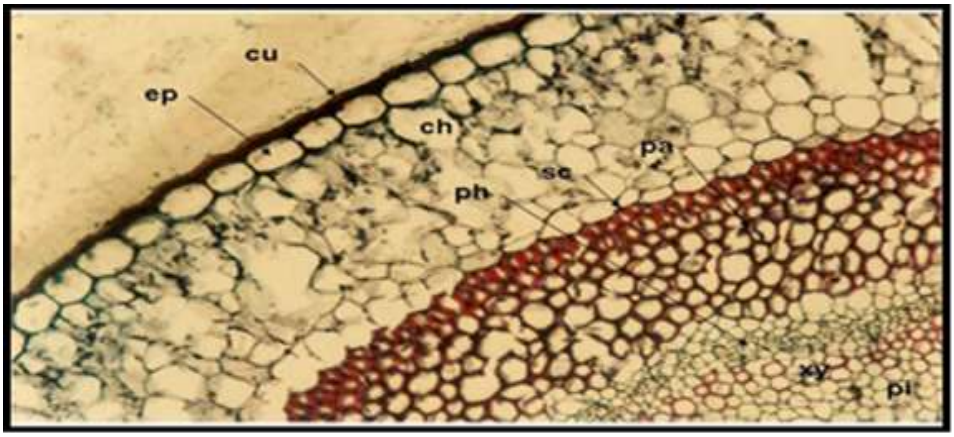

Plate (1) Anatomical structure of the floral stem (a cross section)

MATERIALS AND METHODS

The study was conducted at the faculty of agriculture - university of Basrah for the period from 15/9/2005 to 15/5/2007 to estimate the effect of phosphorus at 0, 100 and 200 mg P_2O_5 /l and potassium at 0,100 and 200 mg K_2O/l as a soil drainage on vase life and anatomical structure of floral stem of Carnation plant *Dianthus caryophyllus* L. in a factorial experiment designed with RCBD in the lath house.

Homogenous eight-month-old plants grown in 25 cm pots were brought from Baghdad and transplanted to a 35 cm pots. All plants received urea fertilizer (N% 46 CO $(NH2)_2$ at 100 mg N/l and treated with phosphorus and potassium 15 days after transplanting in the second pots. Data was tabulated on vase life.

Nine flowers were harvested at full opening stage, they were taken randomly from each treatment early in the morning then, the length of the floral stems was limited to 25 cm (Iordachescu and Verlinden, 2005). These flowers were placed directly in clean, sterile glass containers filled with tap water to the bottom of the upper pair of leaves.

Three flowers were randomly picked and three samples of each stem was taken as cross sections, the first area was located in the middle of the stem and the other two were located three centimeters above and below the middle. The histological sections were used using paraffin wax (Drury *et.al.,* 1967).

The anatomical study was conducted in the laboratories of the Department of biology - Faculty of Science / University of Basrah.

The experiment was carried out using a randomized complete block design in a factorial arrangement and The obtained data were analyzed through analysis of variance procedure using the Statistical Package for Social Sciences computer program (11.0) Means were compared by R.L.S.D. test ($P \geq 0.05$).

RESULTS AND DISCUSSION

Table (1) represented that the highest significant values of vase life 8.36 and 6.98 days were scored during autumn and spring seasons, respectively when applying 200 mg P_2O_5 /l + 200 mg K_2O/l. On the other hand control plants recorded the lowest values of vase life during the previous two seasons were 4.26 and 4.02 days, respectively. The results were in agreement with reports by (Borochov and Woodson 1989).

Table (1): Effect of Phosphorus and potassium on vase life (day) Carnation *Dianthus caryophyllus* L. plant

Phosphorus con. mg P_2O_5/l.	Potassium con. mg K_2O/l.	Spring	Autumn
٠	٠	٤.١٢	٤.٣٢
	١٠٠	٥.٣٤	٥.٦٣
	٢٠٠	٥.٨٩	٦.٢٧
10٠	٠	٤.٧٦	٥.١١
	١٠٠	٥.٩١	٦.٧٨
	٢٠٠	٦.٣٩	٧.٢٤
٢٠٠	٠	٥.٠١	٦.٤٣
	١٠٠	٦.٦١	٧.١٨
	٢٠٠	٦.٩٨	٨.٣٦
RLS $D_{(0.05)}$		**0.111**	**0.188**

It is evident from the cross sections in plate (2) and (3) and data tabulated in table (2) and (3) that the number of rows and thicknesses of xylem and phloem increased significantly as a result of treating with phosphorus at 200 mg at 200 mg P_2O_5 /l and potassium 200 mg K_2O/l. The xylem rows were 3-7 with an average of 5 and the thickness was 42.6-76.6 micrometers at a rate of 59.57 micrometers.

The diameters of vascular bundles in the stem was increased and their diameters and wall thickness increased as well. While the average rows number of phloem cells was5.8 and its thickness was 25.2 micrometers. On the other hand in control plants, the number of vascular bundles in the stem of was the lowest with

smaller diameters and less thickening, the number of rows of xylem was 2-4 with a rate of 3.8 and a xylem tissue thickness 32.0-48.0 micrometers and 40.0 micrometers, and the number of rows of phloem between 3-7 and the rate was 4.7 rows and the thickness was 21.3 - 32.0 Micrometer at the average of 19.7 micrometers.

Table (2): Effect of Phosphorus and potassium on number of xylem and phloem rows in the section of the floral stem of Carnation plant *Dianthus caryophyllus* L.

Phosphorus con. mg P_2O_5/l.	Potassium con. mg K_2O/l.	Xylem rows No.	Phloem rows No.
٠	٠	٣.٨	٤.٧
	١٠٠	٤.٠	٤.٩
	٢٠٠	٤.٠	٥.٢
100	٠	٤.٢	٤.٩
	١٠٠	٤.٣	٥.١
	٢٠٠	٤.٤	٥.٤
200	٠	٤.٢	٥.٠
	١٠٠	٤.٥	٥.١
	٢٠٠	٥.٠	٥.٨
$RLSD_{(0.05)}$		**١.٤٢٣**	**١.٢٥٧**

Table (3): Effect of Phosphorus and potassium on xylem and phloem thickness (µm) in the section of the floral stem of Carnation plant *Dianthus caryophyllus* L.

Phosphorus con. mg P_2O_5/l.	Potassium con. mg K_2O /l.	Xylem thickness	Phloem thickness.
٠	٠	٤٠.٠	١٩.٠
	١٠٠	٤٤.٠	٢١.٩
	٢٠٠	٤٦.٠	٢٢.٣
١٠٠	٠	٤٩.٠	٢١.٧
	١٠٠	٥٢.٦	٢٣.٠
	٢٠٠	٥٣.١	٢٤.٠
٢٠٠	٠	٥٠.٣	٢٢.٠
	١٠٠	٥٥.٠	٢٣.١
	٢٠٠	٥٩.٦	٢٥.٢
$RLSD_{(0.05)}$		**٣.٣٨٦**	**٢.٩٥٤**

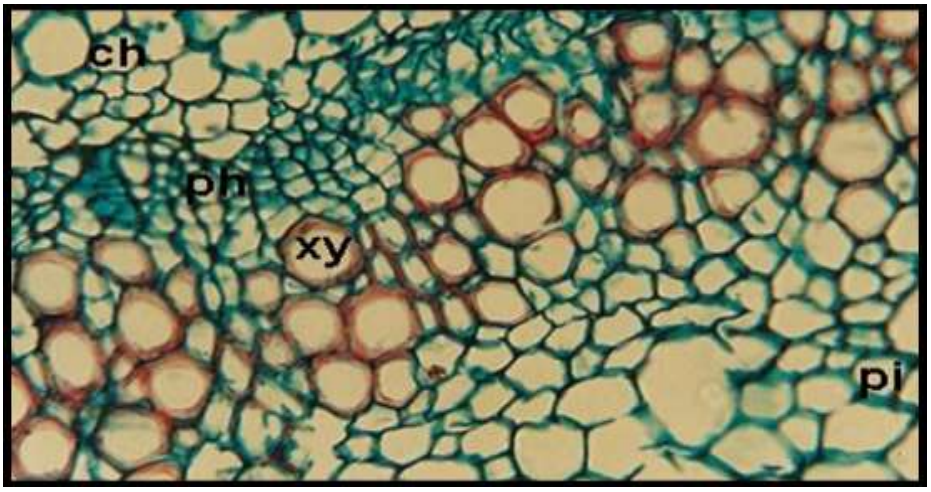

Plate (2) Anatomical structure of the floral stem of carnation *Dianthus caryophyllus* L. plant when treated with 200 mg P_2O_5/l + 100 mg K_2O /l. Pi : Pith (X 10) : Xylem, Phloem , Xy :Ph

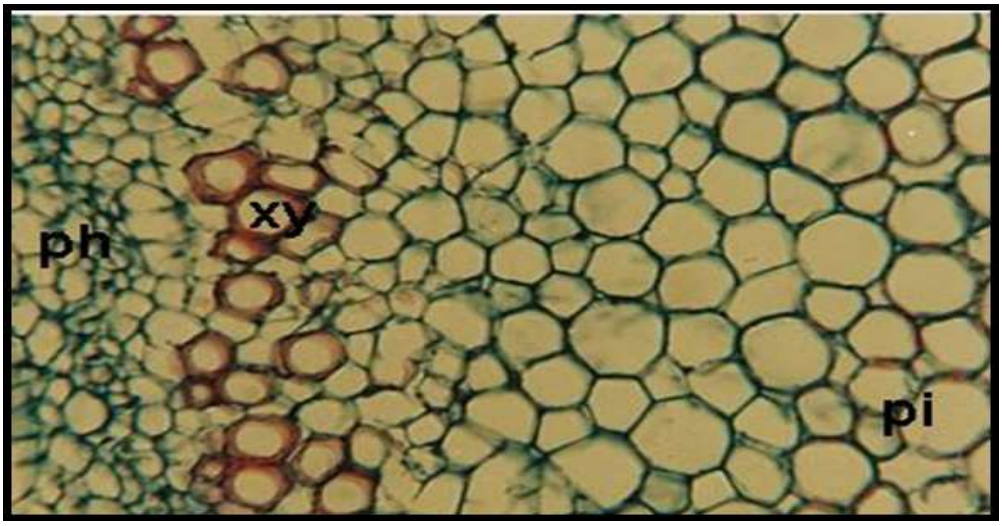

Plate (2) Anatomical structure of the floral stem of carnation *Dianthus caryophyllus* L. in control plants Pi : Pith (X 10) : Xylem, Phloem , Xy :Ph

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تأثير الفوسفور والبوتاسيوم في العمر المزهري وتركيب المقطع العرضي لساق الزهرة في نبات القرنفل *Dianthus caryophyllus* L.

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المستخلص:

اجريت هذه الدراسة في قسم البستنة – كلية الزراعة – جامعة البصرة لمعرفة تأثير الفوسفور بتركيز ٠ و ١٠٠و٢٠٠ ملغم P_2O_5/لتر والبوتاسيوم بتركيز ٠ و ١٠٠و٢٠٠ ملغم / K_2O/l لتر مضافة الى التربة في العمر المزهري وتركيب المقطع العرضي لساق الزهرة في نبات القرنفل *Dianthus caryophyllus* L. في تجربة عاملية صممت بهيئة قطاعات عشوائية كاملة RCBD على نباتات بعمر ثمانية اشهر في ظلة خشبية.

اظهرت النتائج ان الفوسفور بتركيز ١٠٠ او ملغم ٢٠٠ P_2O_5 / لتر والبوتاسيوم بتركيز ١٠٠ او ٢٠٠ ملغم P_2O_5 /لتر زاد من العمر المزهري وعدد صفوف خلايا الخشب واللحاء وسمك تلك الانسجة.

الكلمات المفتاحية : نبات القرنفل، التسميد الكيميائي، الفوسفور، البوتاسيوم.