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Eco-physiological and leaves anatomical study on *Cressa cretica* and *Capparis spinosa* in different saline soil within Babylon province, Iraq

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Abstract

The halophytes *Cressa cretica* and *Capparis spinosa*were collected from two sites differed in their soil salinity within Babylon Province, Iraq. Both TAO & SOD and theanatomical changes of leaves were studied to understand the ability of each species to tolerant soil salinity. Results showed that *Capparis spinosa*increased bothTAO & SOD, while*Cressa cretica*increased SOD in high concentrations only. Salinity induced increase of xylem and phloem in *C. cretica* and the succulence of epidermal cells, while it don't formed a significant anatomical variations in leaves of *C. spinosa*.

Key words: *Cressa cretica, Capparis spinosa* , soil salinity , leaf anatomy, physiological adaptations.

Introduction

Environmental factors influence all the growth of plants , that effecting on both shoot and root [1] . Soil salinity is one of important factors that redounds on vegetation , and its one forms challengenous limiting plant productivity specially in arid and semiarid climates [2] and [3] . It can form many changes on some plant responses like development processes [4] , or on the physiological activities.

Some plants adapted to salinity by many anatomical responses which may be on stems structure [5] or on leaves components [6] and [7] . While others adaptations are including improve genetic responses like rearrangement at the molecular level starting from transcription , regulation of mRNA processing , translation and protein modification or its turnover [8] .

Cressa cretica is linn belong to the family convolvulaceae which is a weeds of pistachio orchards , and it is distributed throughout middle east [9] . It's a halophytic plant and its used in a wide spectrum to control many diseases [10] and [11] .

Capparis spinosa is an important species from capparidaceae and its common shrub of metiterraneancountries and its have an important in production of drugs [12] . It one of component of vegetative cover in dray and arid and saline environment, many studies had shown that it a good source and volatile oils , alkaloids, flavonoids and other substances [13] .

The aim of this work is to explain the main anatomical leaves adaptation of both *Cressa cretica* and*Capparis spinosa*and the content of both TAO and SOD enzymes in these plants and as a result to threat conditions of elevated salinity and temperature .

Material and Methods

Two sites within Babylon province were chosen to collect *C. cretica* and*C. spinosa* and to collect soil samples first site was from AL- Hashimia while the second from AL-Nile regions.

The pH of soil were measured using PH meter type HANA no.2 , while the EC calculated in soil extract that prepared from saturated soil past [14] by ECmeter type HANA no. 4 . Both total soluble ions and salinity were determined in soil

extract (1:5) by multimeter , chlorides concentrations were determined according to ergonometric method [15] .The extract of plants were attended by mashed 1 gm. of fresh leaves with 15 ml of 7.3 buffer phosphate , then depended on stander method to determine SOD and TAO concentrations [16].The hander method with safranine and fast green as stains [17]to study the anatomical variations of leaves between different sites to both species

Results and Discussion

The analysis of soil in both studied explained that they were neutral but the first was very saline soil about 29.6 ms with high content of chlorides 235 mg/L classification of [14] .

Table (1) main studied characters of studied sites .

Site / Parameter	1 (Saline soil)	2 (Non saline soil)
PH	6.9	7. ?
EC (ms)	29.6	4.6
CL (mg/L)	235	7.5
Salinity (%)	222	2.6

Halophytes can tolerant salinity by many adaptations which may be physiological , anatomical or molecular . High salt content specially chloride can lead to modification in their physiological traits [18] and anatomical structural [19] . In this work founded that elevated chlorides and EC caused significant variations of content of both SOD and TAO in both studied species as showed in table 2 , but the content of SOD was elevated in both species that grew in saline soil because plants increased it content under stress conditions (salinity in this study) [20] , which then induce ROS formation which has detrimental effects due to their ability to effect many important biochemical strategies in plants [21] . The content of TAO in *Cressa cretica* wasn't increased in elevated soil salinity and in this it was had same response as well as *Triglochin maritime* [22] , while it increased in *Capares spinosa* which may due to the later not halophytic species . plants usually under saline stress increased the concentrations of many antioxidant substances like proline , ascorbic acid , soluble phenols and others [23].

Table (2) The content of SOD and TAO in studied plants.

Species	TAO (units)		SOD (units)	
	Saline soil	Non saline	Saline soil	Non saline
C. cretica	894.9	915.9	4	2.4
C. spinosa	928.4	690.8	2.4	1.55

The main anatomical changes of upper and lower epidermis layers of leaves of *C. cretica* and *C. spinosa* are illustrated in plates 1 &2 respectively, while plate 3 illustrate the cross sections of their leaves . The epidermal cells of *C. cretica* were circular and they were similar in both surfaces of leaf as they described in other studies [24] but the salinity increased the thickness of their walls and showed a difference in palisade cells diameter, increased the thickness of xylem and phloem tissues and the diameter of their vessels; this result was agreed with same salinity effect on leaved of sorghum plants (25).

In *C. spinosa* the guard cells are uniformly distributed on upper and lower surfaces of leaf , the stomata complex is anomocytic type and the epidermal cells are thick to reduce water loss as adaptation to be xerophyte [26] and [13] , and all these characters were founded in this study which appeared the ability of this species to tolerant salinity. main anatomical changes were decreased the size of guard cells, decreased the anomocytic cells size and increased the numbers of stomata in both upper and lower epidermis.

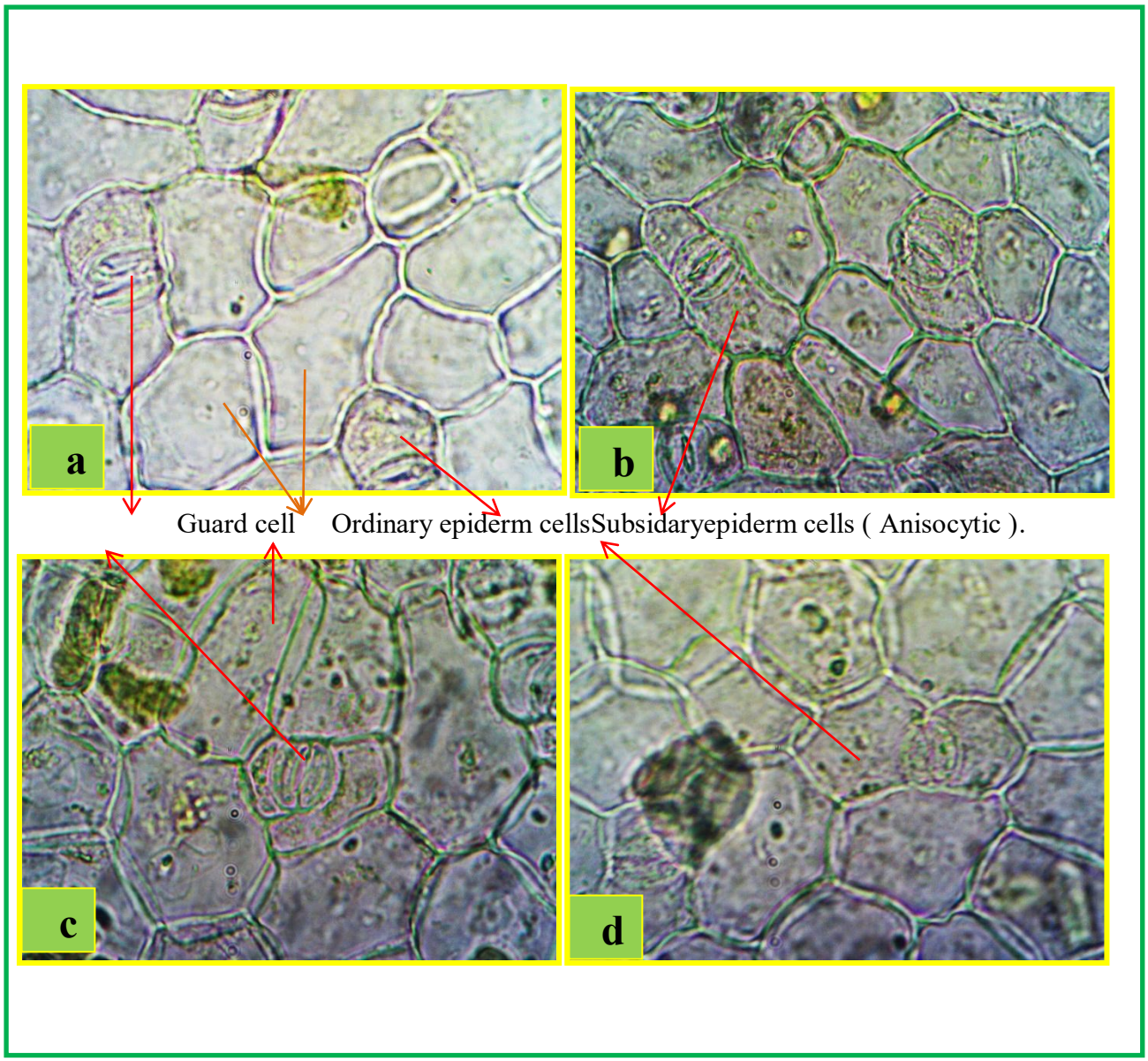

Plate no.1: the differences in epidermal characters of *Cressa cretica*(**a:** lower epidermis innon saline soil,**:b**: upper epidermis saline soil,**c:**: lower epidermis in saline soil, **d**: lower epidermis in saline soil)

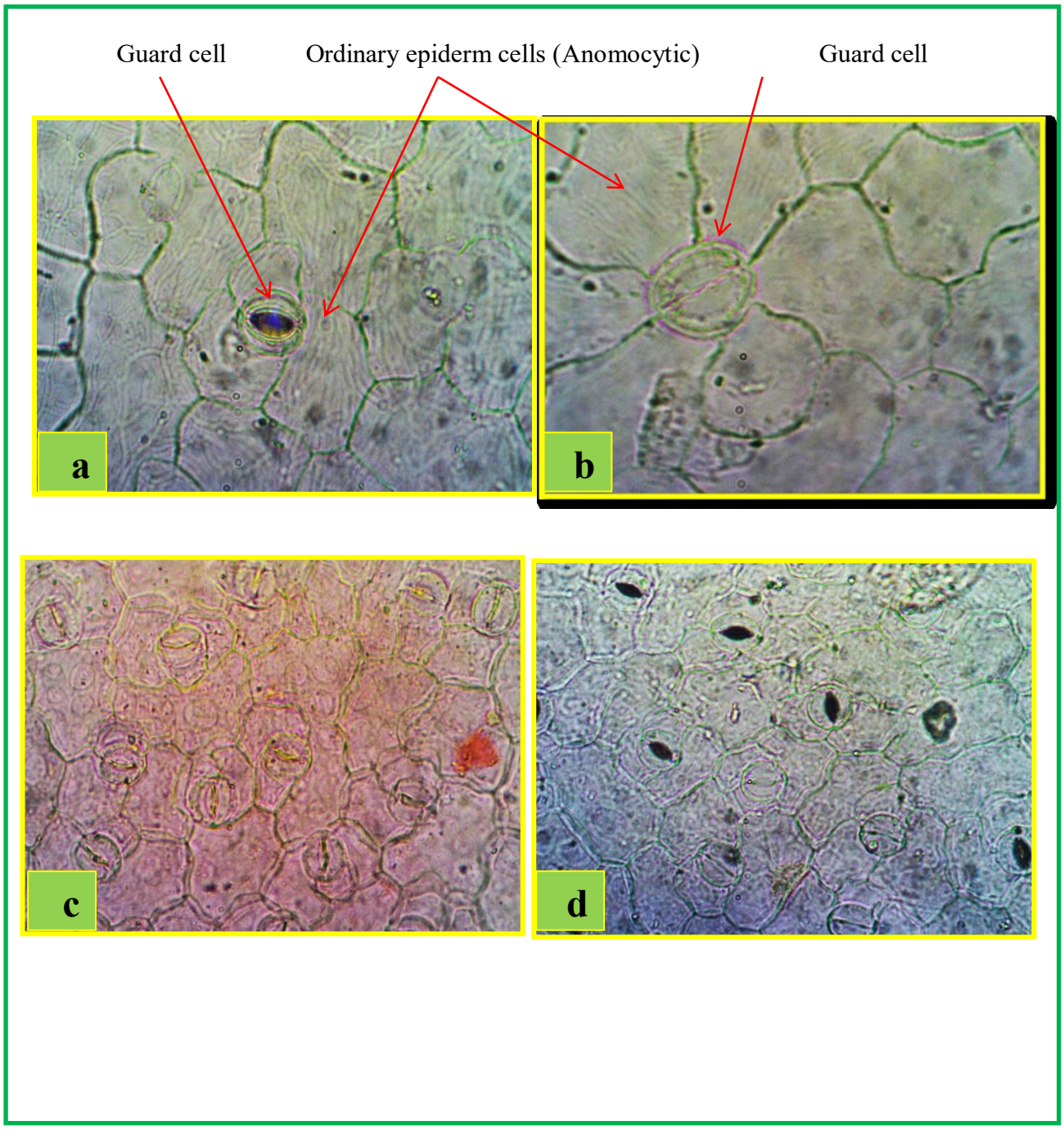

Plate no.2: the differences in epidermal characters of *Capparis spinosa*, , (**a:**lower epidermis in non saline soil, **b:**upper epidermis in non saline soil, **c**:lower epidermis in saline soil, **d**: upper epidermis in saline soil) .

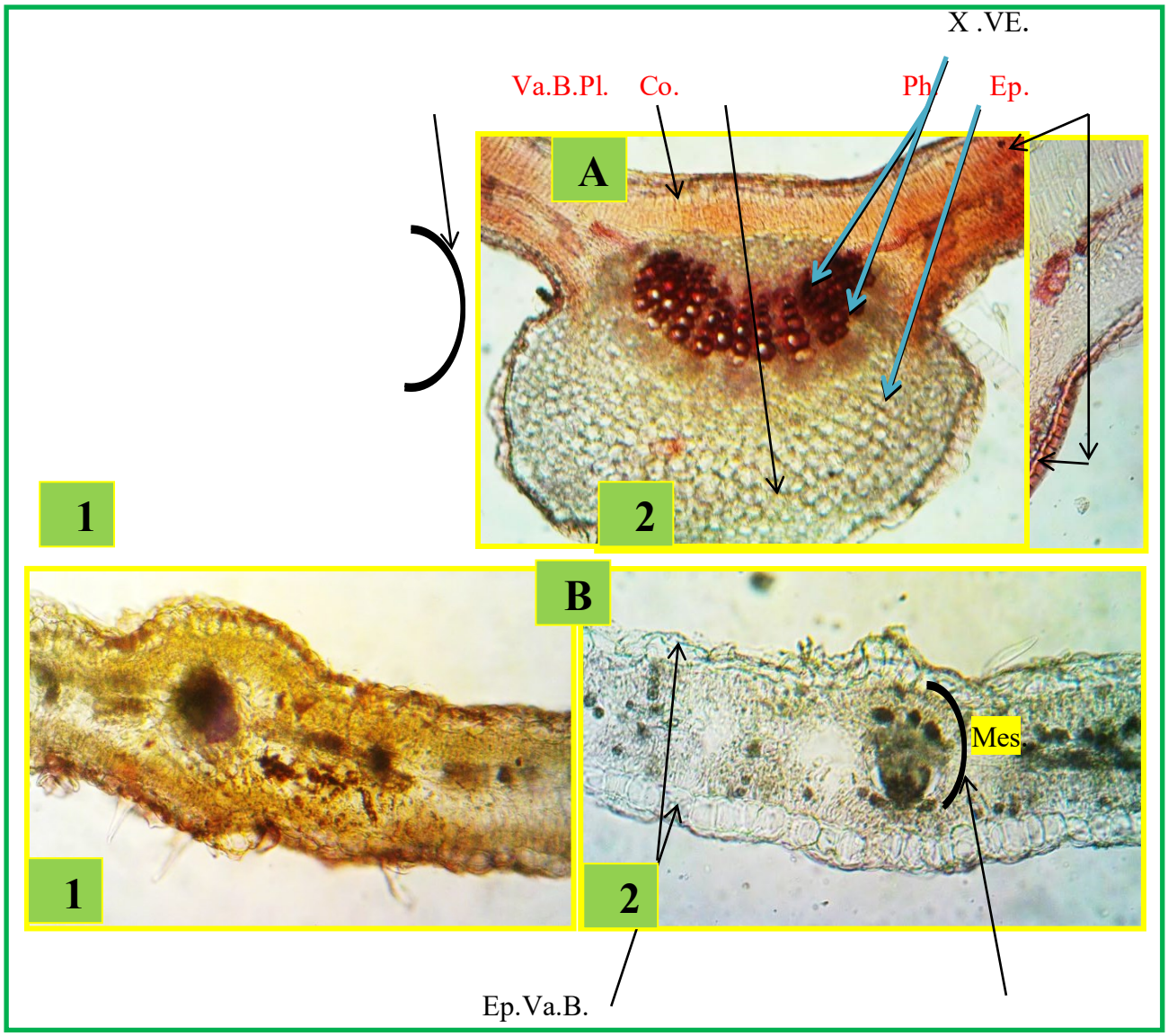

Plate no. 3 : the cross sections of leaves:

A:*Cressa cretica,***B:** *Capparis spinoa*, (**1:**non saline soil , **2:** saline soil) .
Ep. Epidermis cells , **Pl.**(Palisade layer) , **Co**. (Collenchyma tissue) , **Ph**. (Phloem) , **Xv.** (Xylum vessels) .**Mes.** Mesophyll region.

Conclusion

Although *C. cretica* is a halophytebut increased soil salinity can induce physiological and anatomical adaptations to improve its ability to tolerant salinity, but *C. spinosa* can tolerant it by physiological adaptations without changing its leaf anatomy.

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