TAXONOMICAL STUDY FOR THE SPECIES *CHENOPODIUM ALBUM* L. AND *CHENOPODIASTRUM MURALE* L. BELONG TO AMARANTHACE (CHENOPODIACEAE) AT BAGHDAD

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ABSTRACT

The current research dealt with a comparative taxonomic study of the two types *Chenopodium album* L. and *Chenopodiastrum murale* L. at Baghdad , This research was included a cytological study by calculating the chromosome number by sequence n=27,9. and studying the micro-morphological characteristics of the seeds and fruits of the two types, in addition to the surface covering in the leaf part. All phenotypic characteristics of the seeds were studied by scanning electron microscope (SEM) and Light microscope (LM) in terms of shape, colour, dimensions Seed size were measured by the program digmizer , as well as the configuration of the seeds surface , The seeds of *Ch.album* were distinguished by their dark-black color, while the seeds of the other type were greenish-brown, seeds in addition to the fruits, helped to isolate and classify the two types. The surface covering results showed a variation in terms of density and distribution method on the leaf surface , and the presence of glandular-bladder and a glandular hairs was recorded in *Ch.album*, while for *Ch.murale* hairs of the a glandular type were observed. It is worth noting that all the results obtained in this research are presented for the first time in Iraq.

Key words: Seed, fruit, SEM ,LM, cytology,morphological characteristics,seed dimensions

دراسة تصنيفية مقارنة للنوعين *Chenopodium album* L. و *Chenopodiastrum murale* L. العائدين لعائلة عرف الديك في بغداد

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المستخلص

تناول البحث الحالي دراسة تصنيفية مقارنة للنوعين *Chenopodium album* L. و *Chenopodiastrum murale* L. في بغداد ,وتضمن البحث دراسة خلوية بواسطة حساب العدد الكروموسومي للنوعين وحسب التسلسل n=9,n=27,9 كذلك دراسة الصفات المظهرية الدقيقة للبذور والثمار للنوعين ,اضافة الى الكساء السطحي للورقة. ودرست جميع الصفات المظهرية للبذرة بواسطة المجهر الالكتروني الماسح SEM وكذلك المجهر الضوئي LM من حيث شكل, لون وكذلك المظهر الخارجي لسطح البذرة وتم قياس ابعاد البذور باستعمال برنامج digmizer , وتميزت بذور النوع *Ch.album* بلونها الغامق المائل الى السواد بينما بذور النوع الاخر بلون بني مخضر حيث ساعدت البذور بالاضافة الى الثمار على عزل وتصنيف النوعين. اظهرت نتائج الكساء السطحي وجود تباين من حيث الكثافة وطريقة التوزيع على سطحي الورقة النباتية , ,وسجل وجود شعيرات من النوع الغدي المثاني واللاغدي في النوع *Ch.album*, اما النوع *Ch.murale* فتم ملاحظة شعيرات من النوع اللاغدي. ومن الجدير بالذكر ان نتائج البحث تعرض لاول مرة في العراق.

الكلمات المفتاحية: بذور، ثمار، مجهر الكتروني، مجهر ضوئي، دراسة خلوية، صفات مظهرية، ابعاد البذور

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INTRODUCTION

The genus *Chenopodium* L. belong to the family Amaranthaceae and comprises 250 species and subspecies with world wide distribution (21). Amaranthaceae family include about 175 genera and 2000 species of herbs , shrubs, sub shrubs and small trees , it is cosmopolitan widespread family, distributed in tropical and cool temperate regions .in Iraq Amaranthaceae comprise three genus , include 10 wild species and 6 farmed species (15). some of its plants are economically important and also used as vegetables and herbal medicine in various part of the universe.(28) *chenopodium* L. was first established by Linnaeus (1753) who initially placed 22 species in this genus . from these species only three names are belong to *chenopodium* s.s while the other species are recently accepted in about 9 other genera: *Bassia* All., *Blitum* L., *Chenopodastrum* S. Fuentes & al. *Dysphania* R. Br., *Lipandra* Moq., *Oxybasis* Kar. &Kir., *Spirobassia* Freitage & G.Kadereit, *Suaeda Frossk.* Ex J.F.Gmel., and Teloxys Moq. (27). Some species of *chenopodium* genus are economically important either as crops (*Chenopodium* bwrlandieri Moq. subsp. nuttalliae (saff.) H.D. (46) ; *Ch.pallidicaule*; and *Ch.quinoa* willd) Or weeds (*Ch.ambrosioides* L.; *Ch.murale* L.) (45). *Chenopodium album* and *Chenopodiustrum murale* are cosmopolitan, annual herbs having notable economic importance .Due to high phenotypic variability ,*Ch.album* considered one of the most taxonomically difficult groups of taxa in *Chenopodium* genus also possible old and recent hybridization led to numerous nomenclature problems (22). *Ch.album* is green leafy vegetable commonly known as lambsquarters or fat-hen (12,14,31,). it is a native plant of western Asia and have been reported to grow naturally as weed in the fields of barley ,mustard, wheat, gram and other crops(11,13,20). Whole young *Ch.album* have been reported to use as food and herbal medicine . *Ch.album* considered to be a very nutritious herb, and it is rich in many vitamins such as vitamin c, vitamin A, calcium , protein, iron, potassium and phosphorus content.(3) Some of *Ch.album* traditional uses: anthelmintic, carminative, digestive, diuretic and laxative(29,34). Strongly acidic soil to alkaline is the preferred soil condition for the plant growth, and also calcareous soils are preferred(25).it has wide distribution over semi-arid areas. *Chenopodiasrtrum murale* (Nettle leaf goosefoot) is one of the most important, fast growing ,annual, widely distributed weed spesies(25,35). *Ch.murale* is native to western Asia(33), has been used as leaf vegetable and folk medicine in Asia and north America (17). The preferable soil to grow is the moist soil ,*Ch.murale* grow in subtropical, temperate and cool climatic regions(19). some crops infested by *Ch.murale* such as wheat ,maize ,potato ,cauliflower, garlic ,onion and spinach(16,18,36,). According to modern studies ,*Ch.murale* plant extract exhibit antioxidant , antifungul, antibacterial, larvicidal and nematicidal activities (1). It is arich source of secondary metabolites as: flavonoids, terpenoids, di carotenoids, alkaloids, phenolic acids, coumarins, saponine and hydrocarbons (2,47). In Iraq there are several studies on chromosome numbers and seeds on different families as the study of Aliwy on Amaranthaceae family (5,6) and fabaceae (8) in addition to Euphorbiaceae family by Sulaiman (43) and Sadeq (40) on Asteraseae family.

MATERIALS AND METHODS

Fresh green plant samples were randomly collected from different areas of Baghdad during Jan ,Fab. ,March and April in the year 2020, between 8:00 am and 1:00 pm. The collected samples included all ages without consideration to the maturation stage, then immediately stored in farmens fixative and stored in dark for about 24 hr.(44). The taxonomic identification of plants were diagnosed and classified by Dr. Sukayna A.Aliwy. for cytological study , the procedure of Sulaiman(44)was done. Morphology of mature dried seeds were studied by using SEM .The samples were coated with gold and examined under SEM in Iran. Seed size were measured by the program digmizer. The study of the surface covering was carried out by stripping the upper and lower epidermis of the leaves of the samples under study using forceps and dissection tools. The excised parts of the epidermis were placed on slide and dyed with safranine dye then left for (2-5) minutes,

then washed with 70% ethyl alcohol and a drop of glycerine was placed. It was diluted and examined using a light microscope, and the results were photographed and measurements and dimensions of the surface covering were taken. (4,7).

RESULTS AND DISCUSSIONS

Chromosomes number: bout 25 sample were detected for the two species (*Ch.album* and *Ch.murale*) and the chromosomes number for each species was calculated as shown in Table 1.

Table 1.Chromosomes number of species

Species	1N	2N
Ch.album	**27,9**	**54,18**
Ch.murale	**9**	**18**

According to this study *Ch.album* has polyploidy and have n=27,9 ;2n=54,18 this agree with the study of (24, 37, 38) which ensured that the chromosomes number of species was the same even under different environmental conditions. Results of *Ch.murale* supported by the study (38,23,9).

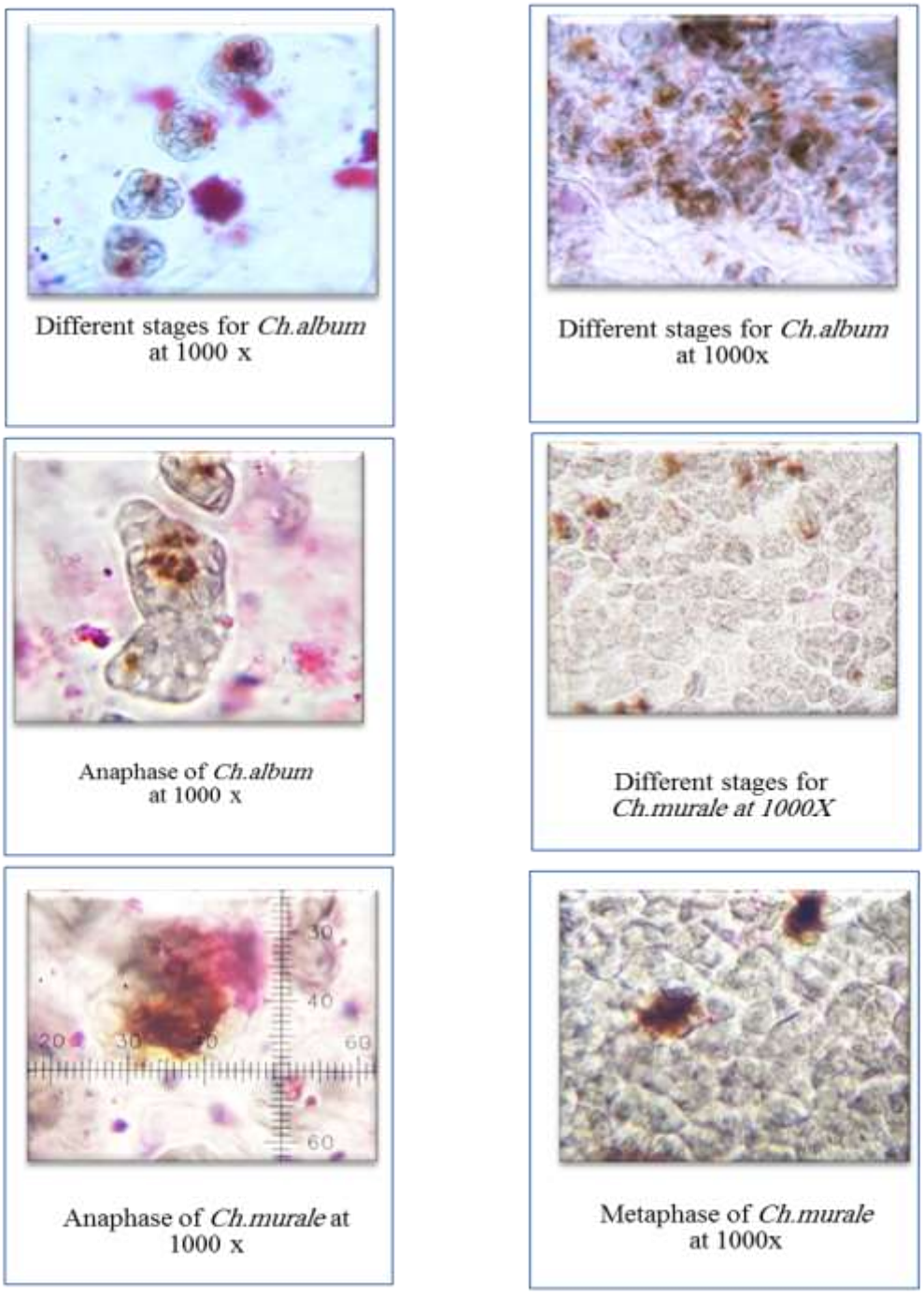

Figure1. Phases of chromosomal division of the two studied species using light microscope(1000x).

Seeds: The results of the light microscopy showed that the external general appearance of the seeds for the type *Ch. album* was spherical, tapered on one side, black or very dark brown, with a coarse texture. The seed is convex on one side and concave on the other, and the dimensions average of the seed were (1.0-1.25 mm). As for *Ch.mulrale* seeds, the general shape was spherical and the seed was concave. Slightly from the top and protruding from the bottom, the color of the seed is greenish-brown with a rough texture, and its dimensions were (1.4-2.1) mm (table 3), and it was possible to distinguished and isolate between the two types through the characters of seeds and fruits (10).

Electron microscopy results

Results shown that the surface configuration of the seed of the type *Ch.album* was represented in form of circular elevations arranged in concentric rows and in the form of rays extending from the margens of the seed to its centre. plate No. (2) These circles were of high edges that confine a deep depression and were connected to each other in a grid. plate No. (3). While the type *Ch.murale*, was observed from plate (6) the presence of rays of elevations extending from the outer sides of the seed and meeting at one point in the radius of the circle (the centre of the seed). These rays are in the form of single zigzag protrusions that are arranged in one row. plate No.(6) , These protrusions are in the form of vertical plates on the surface with different geometric shapes. plate No. (7).

Table2. Shows the dimensions and characteristics of seed in an electron microscope

Species	Seed shape	Dimensions		Surface configuration
		Seed width	Seed length	
Ch.album	**Spherical tapered on one side**	**11.41**	**10.00**	**Smooth with radial rows**
Ch.murale	**spherical concave top**	**11.60**	**10.00**	**Pitted**

Table 3. Shows seed dimensions and characteristics by the light microscope(LM).

Species	Seed shape	Dimensions		Surface configuration
		Seed width mm	Seed length mm	
Ch.album	**Spherical tapered on one side**	**1.0**	**1.25**	**Smooth with radial rows**
Ch.murale	**spherical concave top**	**1.4**	**2.1**	**Pitted**

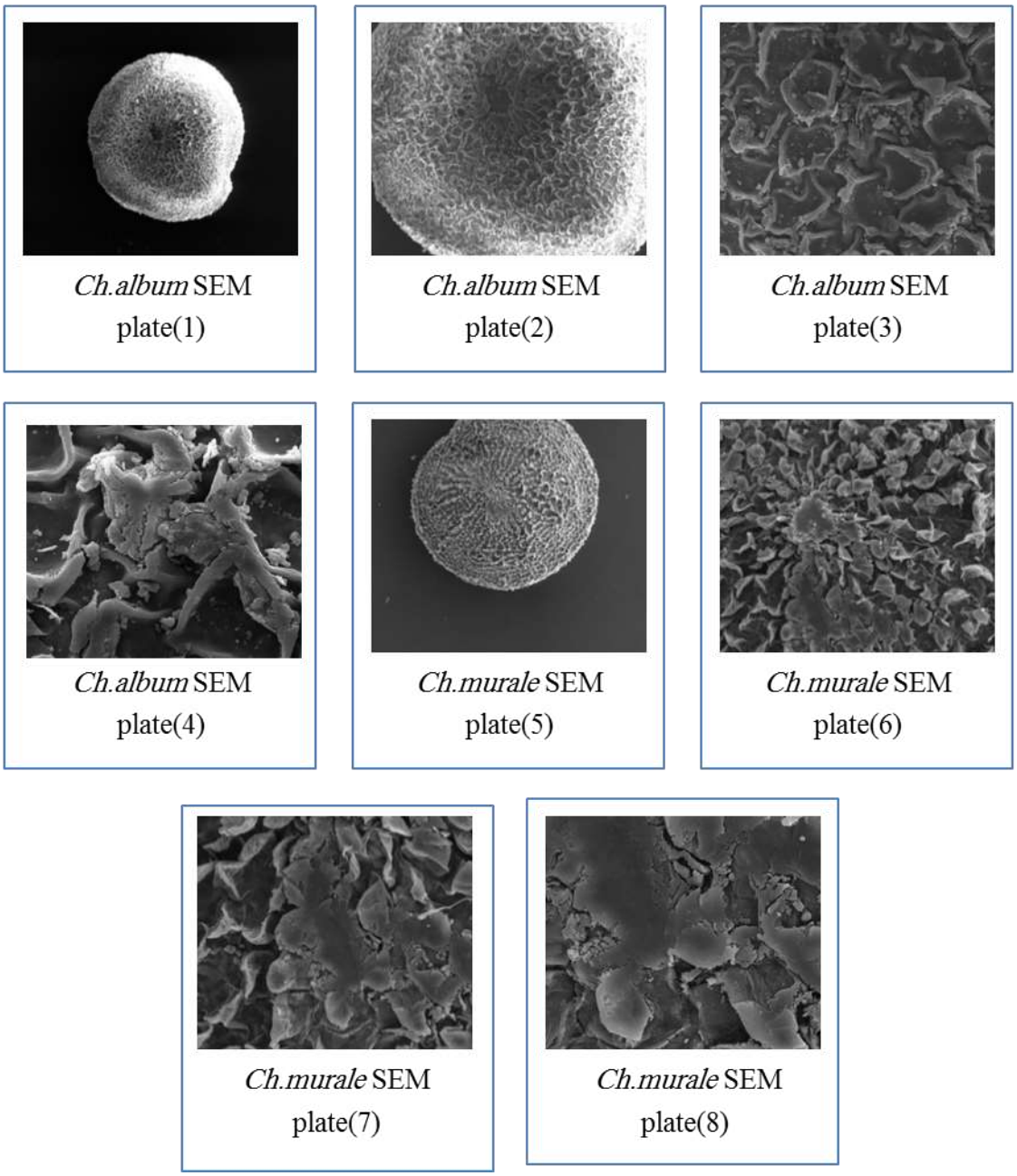

Figure2. Scanning electron microscope showing seeds configuration for the two species

Fruit: The fruit of the type *Ch.murale* was goblet-shaped, consisting of a high ovary surrounded by five number of pericarps , and it was in the form of scaly leaves in the form of a dome, the single pericarp with a curved glossy shape of green color and white edges mediated by a ridge along the cover, and there is an inner layer of The covers are in the form of thin white strips. The average dimensions of the fruit were (1.5-2.4) mm. As for the type *Ch.album*, the fruit appears in a circular shape, green in color and high white, containing five pericarps surrounding the seed, pericarp with a number of white scales, the covers are connected from the base and separated from the top , covering the seed completely. The average dimensions of fruit were (1.25-2.6mm). From these results it can be enable to isolated the two species (40,42). Dimensions of the fruit reached mm ,table (4).

Table4. Shows dimensions and characteristics of fruit by light microscope(LM.)

species	Fruit shape	Dimensions	
		Fruit width mm	Fruit length mm
Ch.album	**circular**	**1.25**	**2.6**
Ch.murale	**cup**	**1.5**	**2.4**

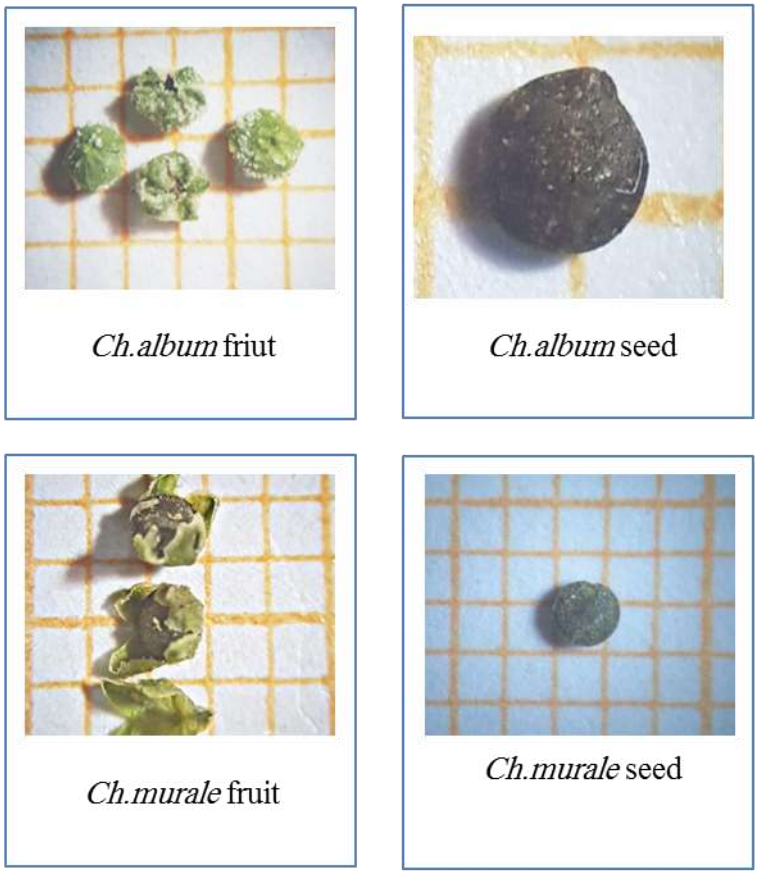

Figure3. Seeds and fruits of the two studied species using Dissect light microscope

Indumentum: From the results of current study, it became clear that there is a discrepancy in the surface covering in terms of its density and the way it is distributed over the leaf and the surface covering can be divided on the basis of this discrepancy into three types:

First: Glandular hairs or bladder hairs.

Second: A glandular hairs

Third: the papillae

Glandular hairs: As for the type *Ch.album*, it was observed the presence of hairs of the glandular type, the hair of this type is composed of a glandular head consisting of one part and this head rests on a neck consisting of one part, and the base of the hair consists of one cell surrounded by a number of cells. The width of the base was (10.3) µm and the total length of the hair was (10.9) µm, the hair was observed on the upper and lower surfaces of the leaf. plate number (1)

A glandular hairs: These hairs can be divided on the basis of the number of cells:

Unicellular uniserraite

uniserriate double-celled

uniserriate and unicellular a glandular hairs:

On the surface of the leaf of the species *Ch.album*, a hairs were found, not a glandular, single-row, single-celled, where the hair is simple and single-celled with a flat head, and the base is composed of one cell and surrounded by two to three cells, the width of the base is (7) micrometers, and the length of the hair is (6)) micrometer. Filaments are observed on the upper and lower leaf surfaces. plate number (2)

A glandular hairs, single-row bicellular:

This type of hairs was observed on the surface of the leaves of the two species *Ch.album* and *Ch.murale* from the upper and lower sides. plate number (3,4,5) In *Ch.album* hair was single-row bicellular and resting on a base consisting of one cell surrounded by three oval cells, the average hair length is (30) micrometers. The base is (1.4) micrometers plate(3) . As for plate(4), the filament consists of two cells and the base is of two cells as well. The length of the hair was (9) micrometers, and the width of the base (10) micrometers. As for plate (5), it was the hair single-row two-celled with a flat head, and the base consisted of one cell, the width of the base was (10.5) µm, and the total length of the

filament was (10.2) µm. As for the filament in the type *Ch.murale*, it was distinguished by being single-row with a flattened head and connected to two cells based on a base consisting of two cells. The length of the hair reached (48) micrometers, and the base was approximately (5) micrometers. plate (6)

Papillae: The papillae are scattered on the outer surface of the leaf in both species under study.

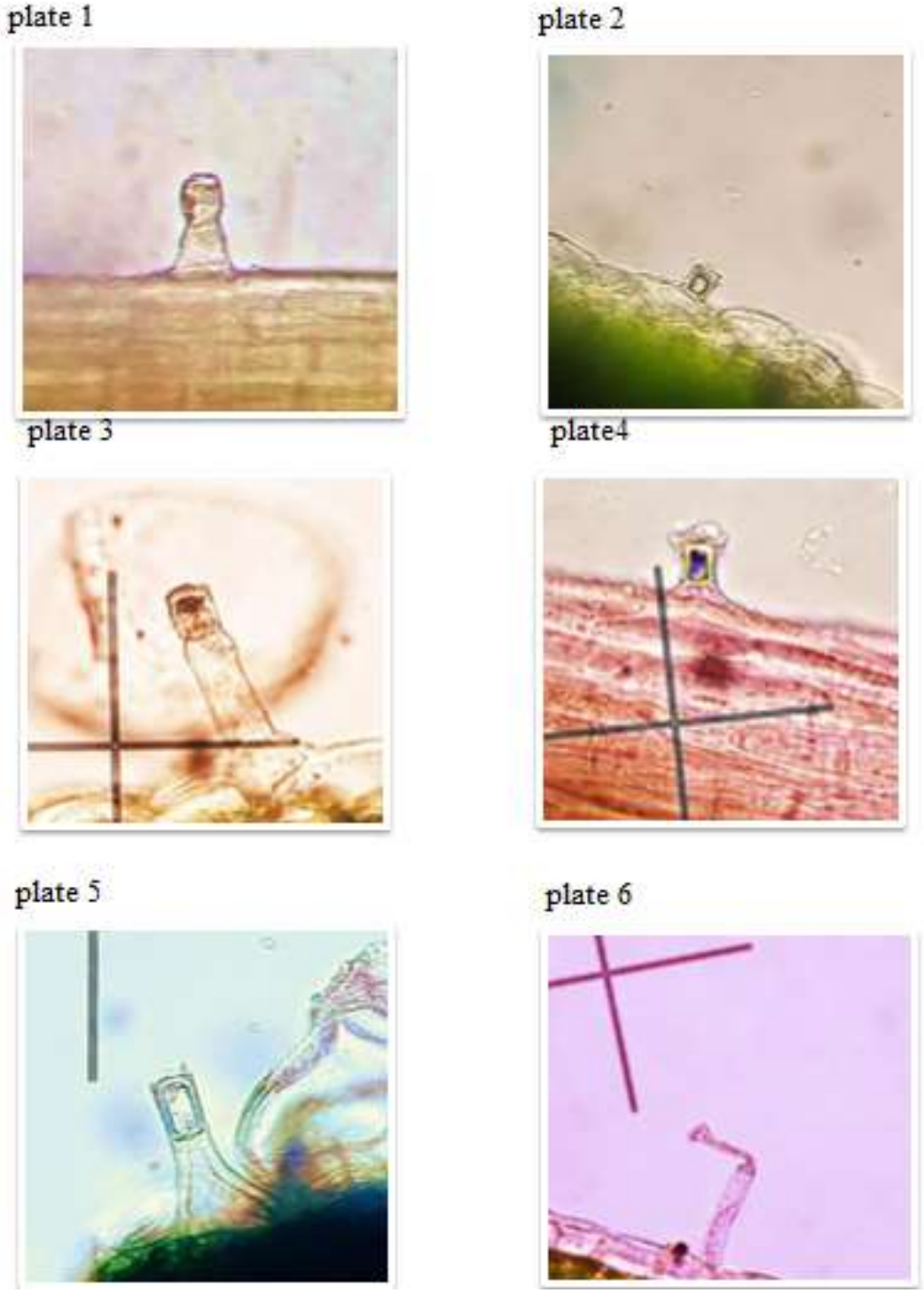

Figure4. Shows indumentum at 40x

Table5. Qwantitative and qualitative traits for two species of under studies measuring by micrometer

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