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MICROMORPHOLOGY OF LIGULE FOR SOME SPECIES OF THE TRIBE LACTUCEAE

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Abstract

The Micromorphology of Ligule epidermis was investigated in 28 species from 16 genera of the tribe Lactuceae using scanning electron microscope. The study showed that some of these charecters have a good taxonomic importance to distinguish between the studied taxa, such as the shape of epidermal cells and the ornamentation of the outer cell walls. The presence or absence of stomata, waxy deposited and the nature of anticlinal walls were found to be valuable at generic and species level.

Keywords: Micromorphology, Ligule, Species, Tribe Lactuceae

INTRODUCTION

The tribe of Lactuceae comprises 93 genera and more than 1600 species found primarily in temperate regions of the eastern hemisphere (Brouillet et al., 2006) .Most species of the tribe are herbaceous annual or perennial plants ,rarely shrubs ,sub shrubs or vines (Kilian et al.,2016). This tribe consists of taxa with milky latex and capitula with 5 dentate bisexual ligulate florets (Enke, 2000; Kilian et al.,2016) . Anatomical data are easily applied to improving classification and identification of different taxa (Cutler et al., 2017) .Floral anatomy has played asignificant role in solving many morphological problems (Pandy &Misra, 2009). Microcharachters in epidermis of ligule may be useful in the taxonomy of the family Asteraceae at different levels, especially with scanning electron microscope (Cutler et al., 2007). In traditional studies, the charecteristics of ray florets are often neglected (Bagooe, 1977). A little work has been focused on charecteristics of ligule of Asteraceae, but on specific work on ligule micromorphology of the tribe Lactuceaehas yet been decumented. The aim of this present study was explain the micro morphological characters of ligule in different species of Lactuceae.

MATERIALS AND METHODS

28 species of 16 genera Table (1) belonging to the tribe Lactuceae were examined for ligule micro morphological charecters. The micromorphology of the epidermis surface of the ligules from mature flowers was compared .The non- fixative ligules were mounted on aluminum stubs with double – sided adhesive carbon type and sputter – coated with gold in IB-2 ion coater , at least 10 ligules were randomly selected and studied .The coated materials were examined and photographed with Inspect 50S scaning electron microscope at an accelerating voltage of 20 Kv.In this paper we followed Bagooe,1977: Barthlott,1990) for description of scanning electron microscope .

The Seybold Report
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RESULTS AND DISCUSSION

The data of micromorphological features of the Ligule of the examined taxa were summarized in Table (1)and shown in figures (1 ,2 , 3 , 4 ,5 ,6 ,7 ,8,9.10) . Ligule epidermis of 28 species belong to different genera of the tribe Lactuceae have been studied. The study showed that the cells of epidermis were either tubular as in Cichorium intybus , Cichorium glandulosum , Lactuca aculeata , Lactuca serriola ,Launaea angustifolia , Launaea fallex , Launaea capitata ,Reichardia tingitana ,Koelpinia linearis ,Geropogon glabrum , Sonchus oleraceus or fusiform in Streptorrhamphus tuberosus , Launaea nudicaulis , Scolymus maculatus , Tragopogon dubis and irregular in all other taxa Table (1). The surface of epidermis is generally smooth in all examined taxa except Lactuca sativa,Rhagadiolus stellatus. Which is reticulate .other cuticular ornamentation (undulation,regulate ,granulated or striated) were also noted .As it is seen in figure(1) the striation of surface of epidermis was in transverse in the two species , Rechardia tingitana , Leontodon lacinatus figure (6).some investigated taxa have anticlinal cell wall with septa ,sometimes slightly thicknes as in Cichorium intybus , Launaea fallex , Launaea angustifolia , Scariola orientalis , Uorospermum picroides . All examined species without waxy deposite except the species Launaea mucronata. Based on the presence or absence of stomata, all examined species fall into two groups while Cichorium glandulosum, Cichorium intybus , Cichorium pumillium , Launaea capitata , Cephalorrhynchus microcephalus with stomata , other with out

Plant anatomy uses several features for identification of species and higher levels, especially when observed with electron microscope (Mukbul et al., 2011). All features observed with electron microscope are useful criteria for taxonomy of the genera in the family Compositae (Laue, 1985). Current study showed obvious differences in the shape of epidermal cells of ligule in the examined species, as it was tubular fusiform or irregular, so it was important in taxonomy of the studies species .The differences in cell shapes is related to the rate of growth, except for the corolla which is fixed (Esau, 1965). The epidermis of corolla exhibit diverse cuticular ornamentation, smooth, reticulate and others. Transverse striation were found to be significant to separate the species Leontodon lacinatus and Reichardia tingitana from all others. striation is the common type of the corolla surface ornamentation as mentioned by (Esau ,1965 ; Cutler et al., 2007) .The ligules in the tribe Lactuceae are usually free form stomata (Kilian et al.,2016). But sometimes occurs (Esau, 1965), this charecters valuable to separate the studies species. Presence or absence of septa in the anticlinal walls, have a good taxonomic importance to identify the species (Kilian et al., 2016) show that the anticlinal walls of ligule epidermal cells are usually septate.

The Seybold Report
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Table 1: Anatomical characteristics of some species of the tribe Lactuceae wih their subtribes. (Classification of subtribes according to Rechinger and Lack, 1977)

Seria. No	Species	Subtribe	Cuticle ornamotion	Shape of cells	Presence Or Absence Septa	Presence Or Absence Stomata	Waxy deposite
1	Cephalorrhynchus microcephalus	Crepidinae	Smooth-undulat	irregular	–	+	–
2	Cichorium glandulosum	Cichorineae	smooth	tubular	+	+	–
3	Cichorium intybus L.	Cichorineae	smooth	tubular	–	–	–
4	Cichorium pumilum	Cichorineae	smooth	irregular	–	+	–
5	Geropogon glabrum	Scorzorineae	smooth-striate	tubular	–	–	–
6	Koelpinia linearis	Cichorineae	striate	tubular	–	–	–
7	Lactuca aculeata	Crepidinae	smooth	tubular	–	–	–
8	Lactuca sativa	Crepidinae	reticulate	irregular	–	–	–
9	Lactuca serriola	Crepidinae	smooth	irregular	–	–	–
10	Launaea angustifolia	Crepidinae	smooth	tubular	+	–	–
11	Launaea capitata	Crepidinae	smooth - granulate	tubular	–	+	–
12	Launaea fallex	Crepidinae	smooth - striate	tubular	+	–	–
13	Launaea mucronata	Crepidinae	smooth	irregular	–	–	+
14	Launaea nudicaulis	Crepidinae	smooth-regulate	tubular	–	–	–
15	Launaea procombens	Crepidinae	reticulate	iIrregular	–	–	–
16	Leontodon lacinatus	Leontodontinae	striate	irregular	–	–	–
17	Picris babylonica	Leontodontinae	striate	fusiform	–	–	–
18	Reichardia tingitana	Crepidinae	striate-granulate	tubular	–	–	–
19	Rhagadiolus angulosus	Leontodontinae	smooth	tubular	–	–	–
20	Rhagadiolus stelattus	Leontodontinae	reticulate	irregular	–	–	–
21	Scariola orientalis	Crepidinae	smooth	irregular	–	–	–
22	Scariola viminea	Crepidinae	smooth	tubular	+	–	–
23	Scolymus maculatus	Scolyminae	smooth-rugulate	Irregular	–	–	–
24	Sonchus oleraceus	Crepidinae	smooth-Striate	tubular	–	–	–
25	Streptorrhamphus tuberosus	Crepidinae	smooth-granulate	fusiform	–	–	–
26	Tragopogon reticulatus	Scorzorineae	striate	tubular	–	–	–
27	Tragopogon longirostris	Scorzorineae	striate	tubular	–	–	–
28	Urospermum picroides	Leontodontinae	striate	irregular	+	–	–

The Seybold Report
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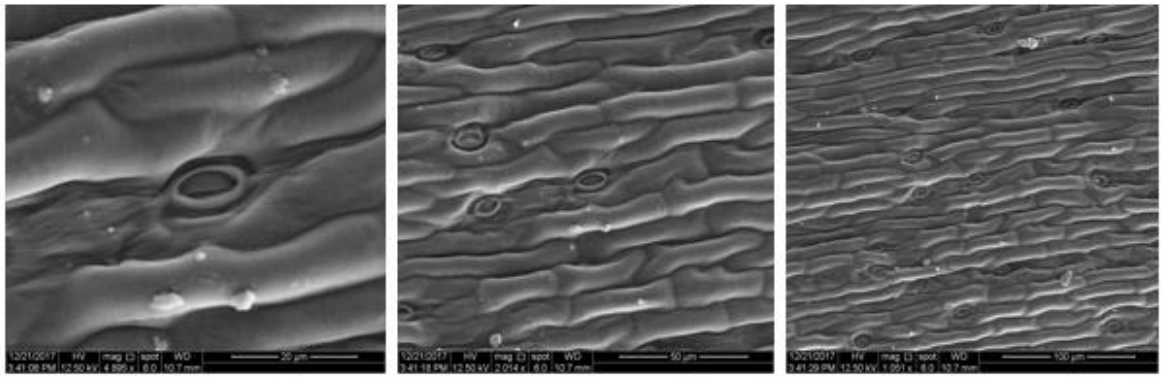
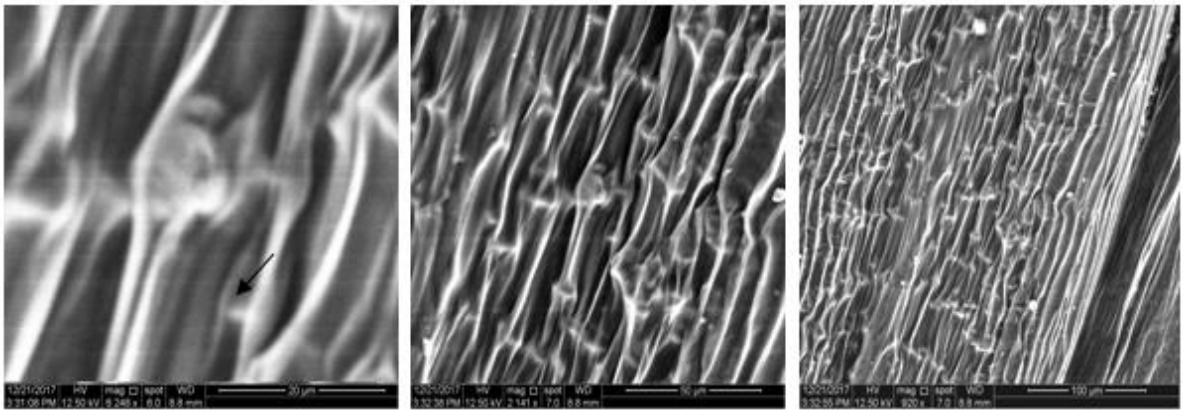
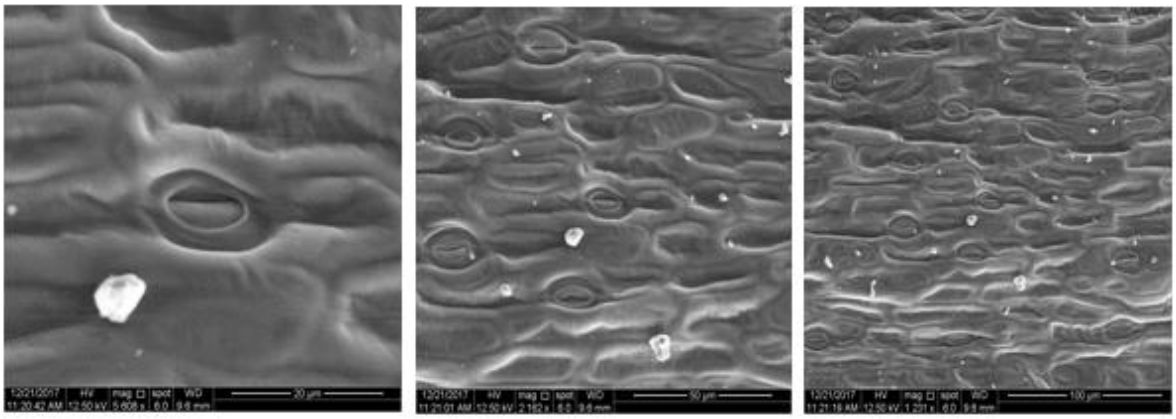


Cichorium glandulosum



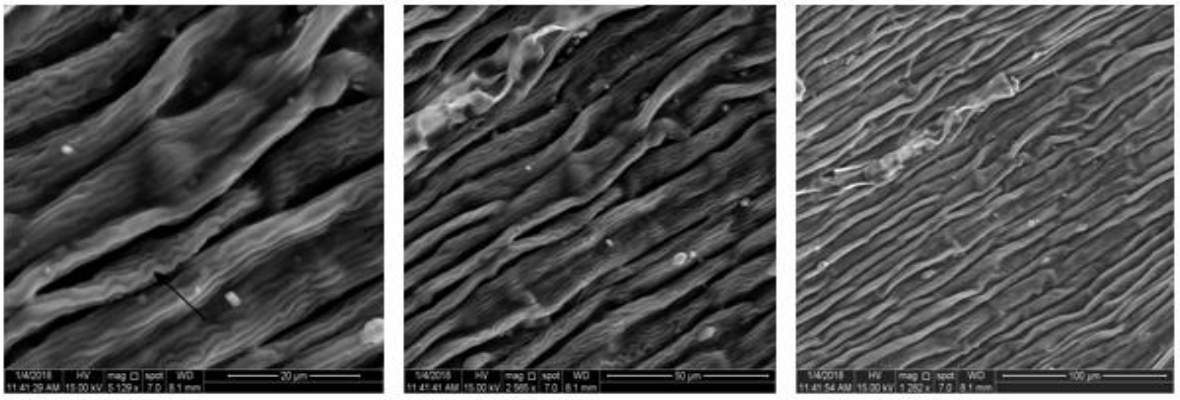
Cichorium intybus

Figure 1: Scanning electron micrographs of ligule epidermis in some Lactuceae species

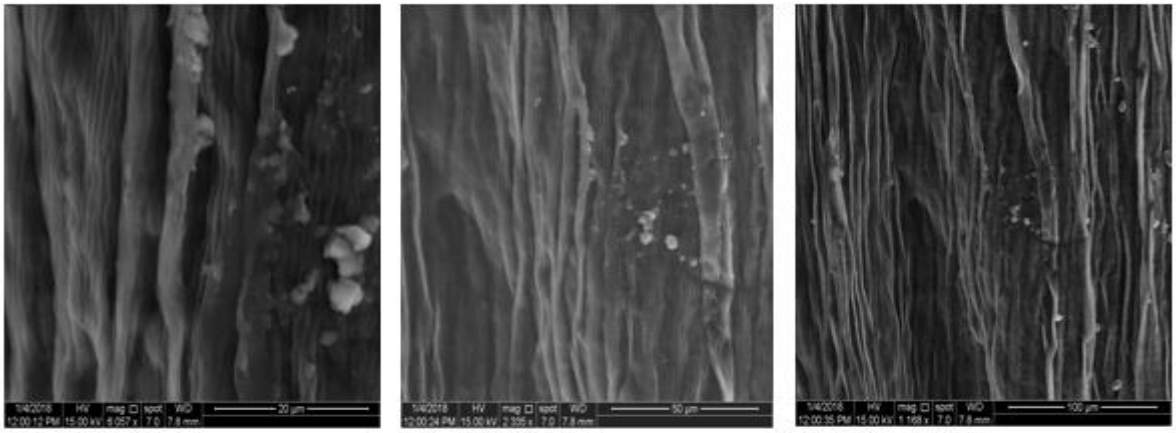


Cichorium pumilum

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

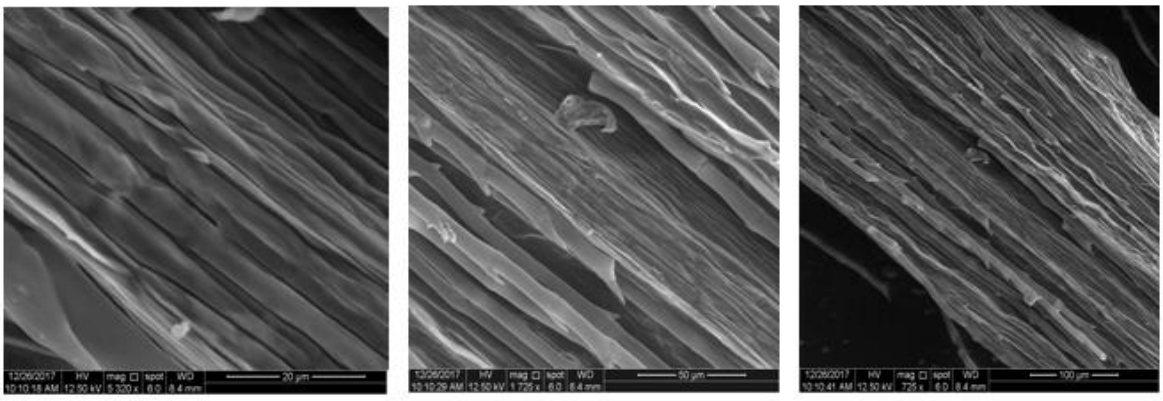


Geropogon glabrum



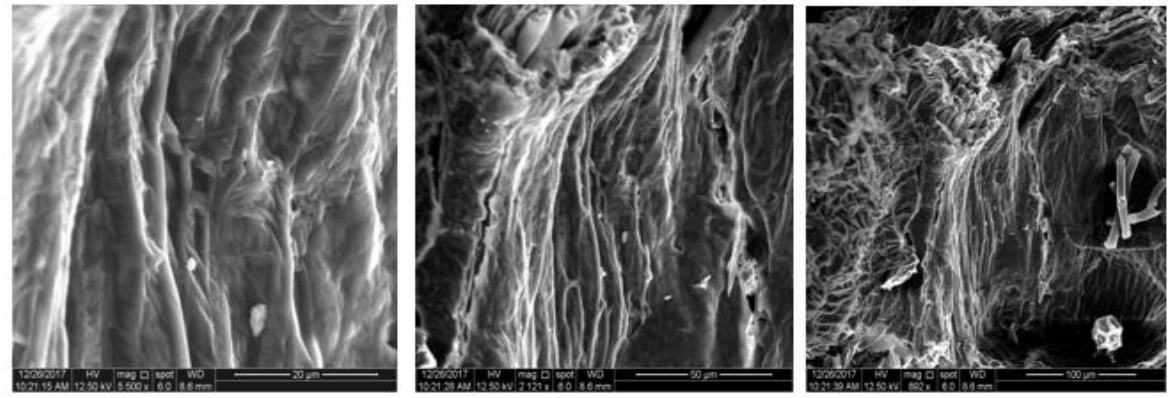
Koelpinia linearis

Figure 2: Scanning electron micrographs of ligule epidermis in some Lactuceae species

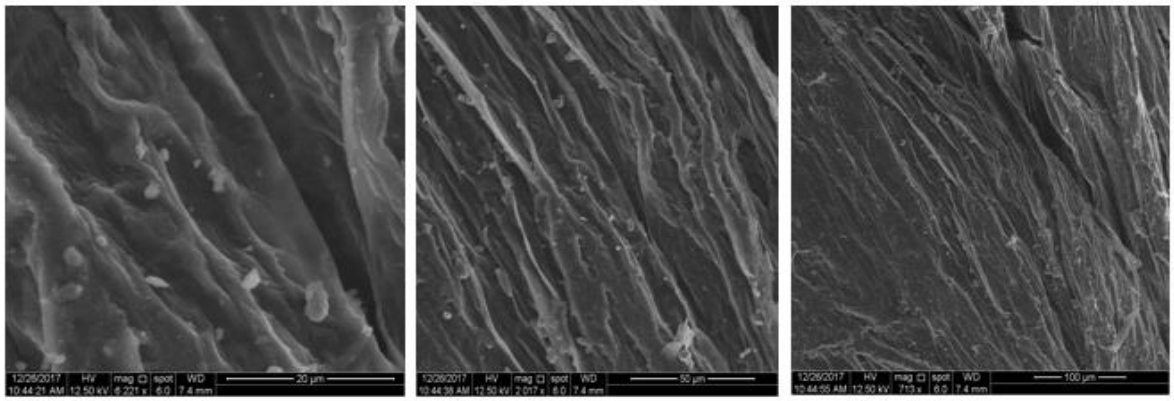


Lactuca aculeata

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

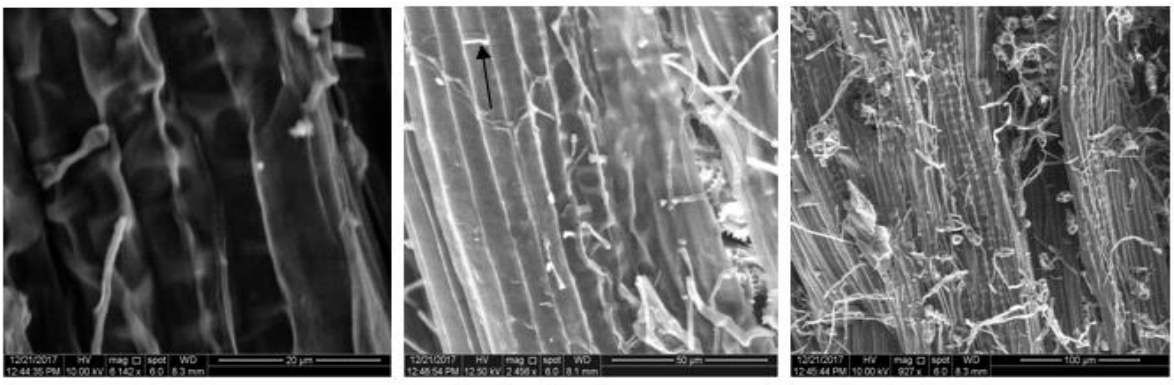


Lactuca sativa



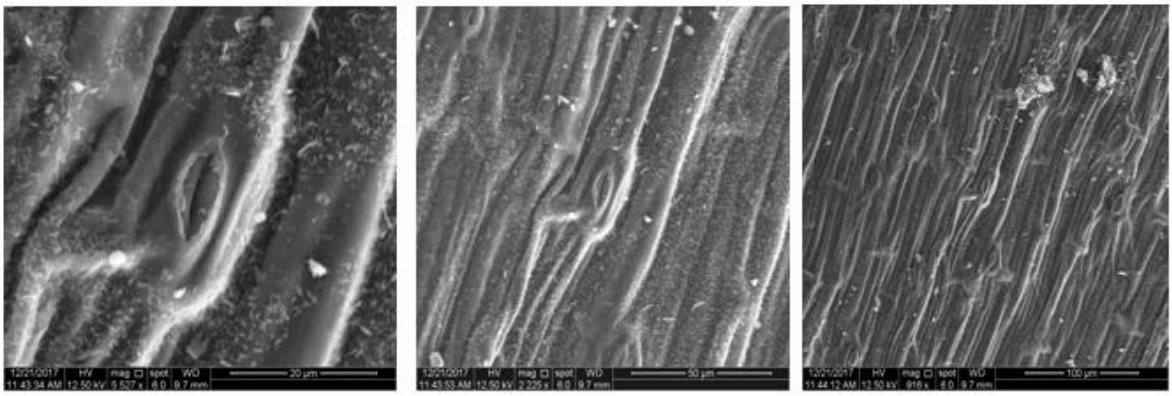
Lactuca serriola

Figure 3: Scanning electron micrographs of ligule epidermis in some Lactuceae species

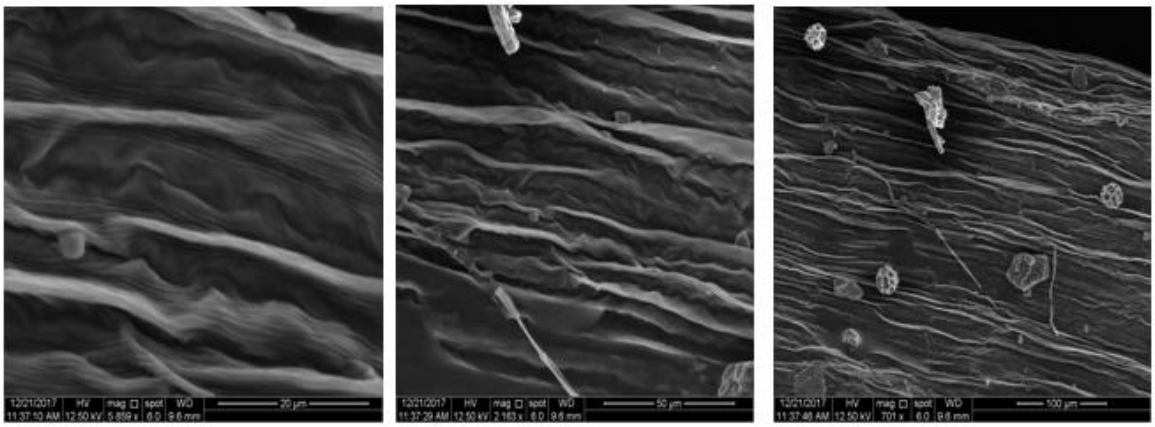


Launaea angustifolia

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

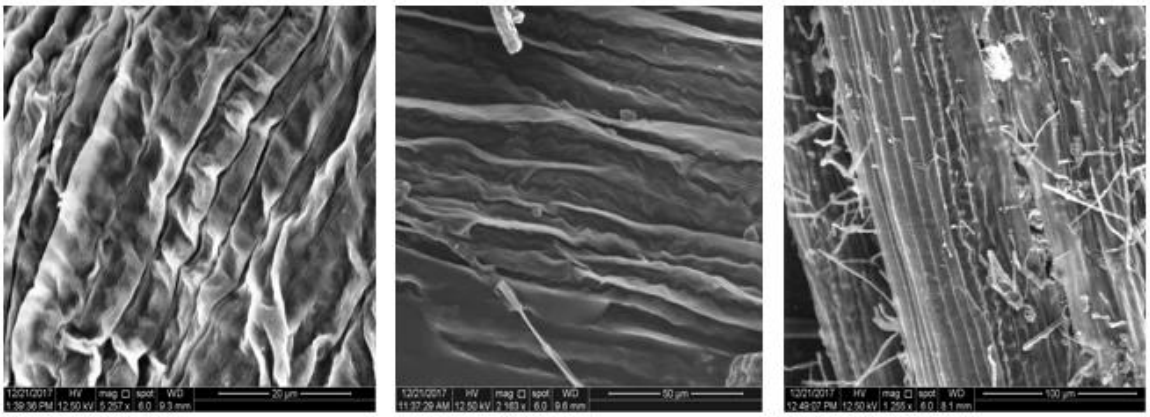


Launaea capitata



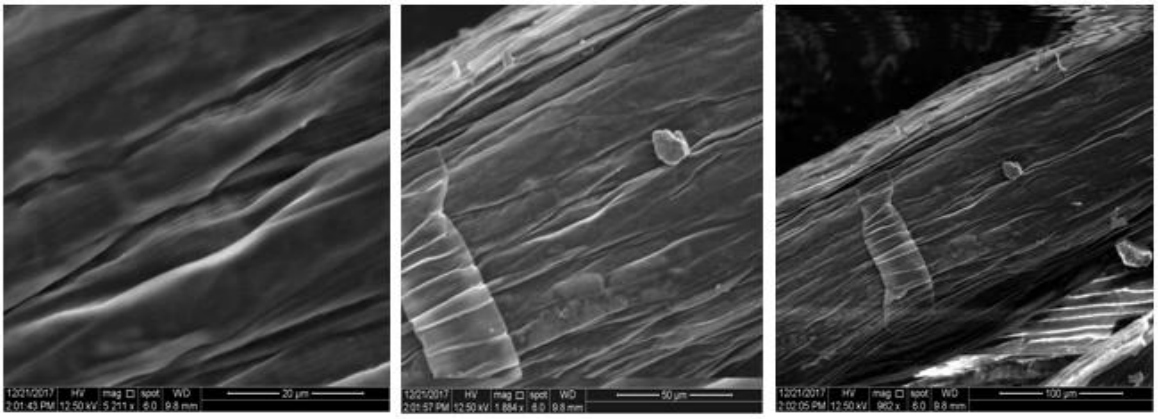
Launaea fallex

Figure 4: Scanning electron micrographs of ligule epidermis in some Lactuceae species

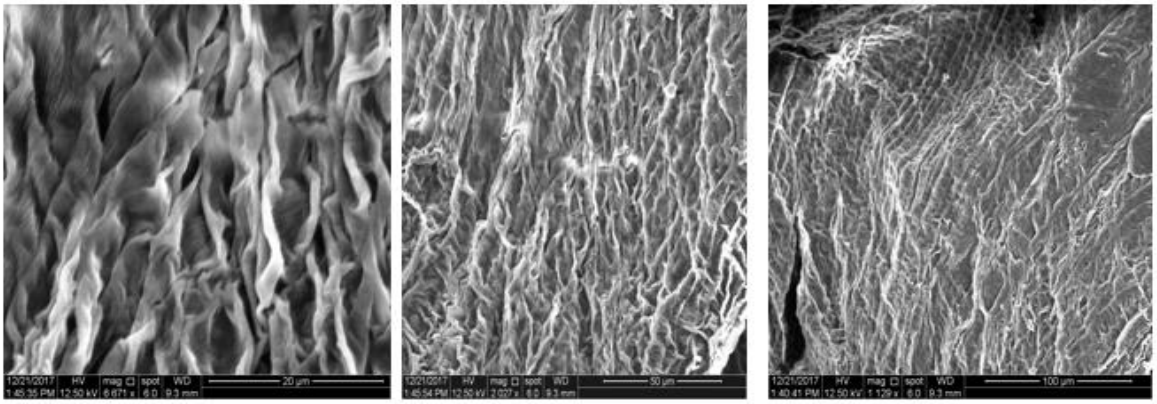


Launaea nudicaulis

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

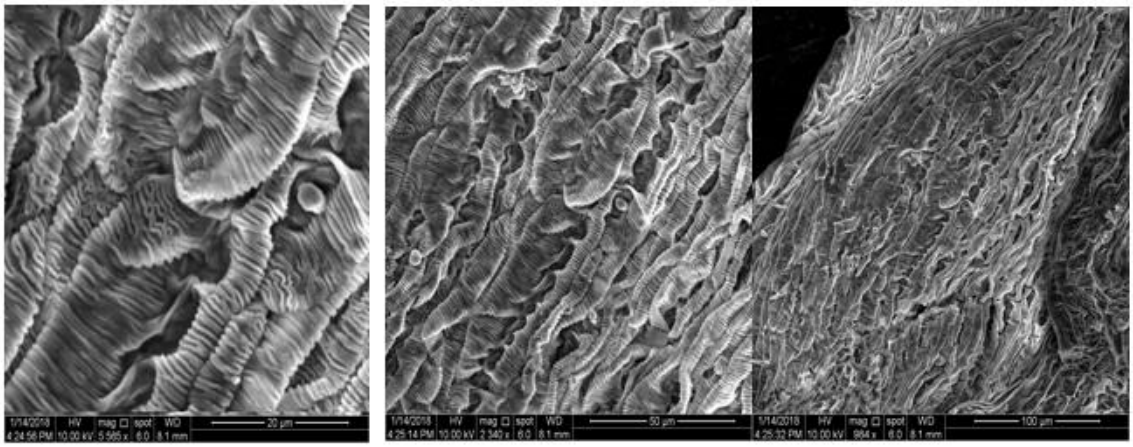


Launaea mucronata



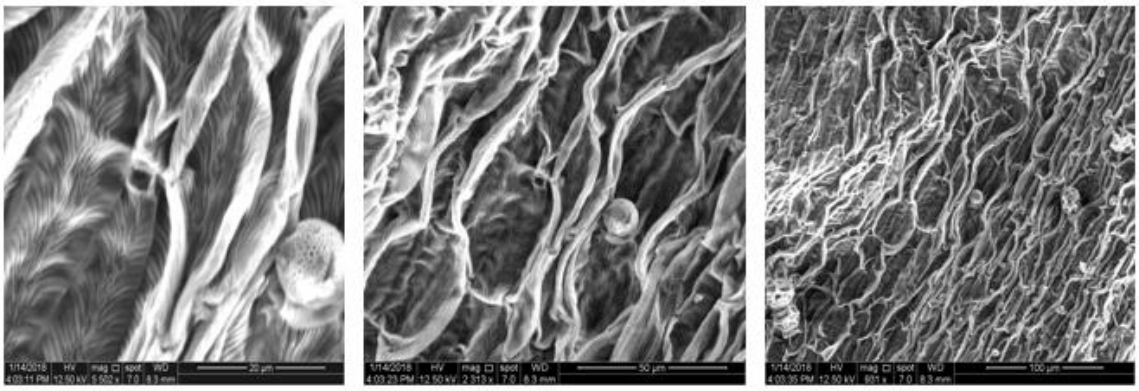
Launaea procombens

Figure 5: Scanning electron micrographs of ligule epidermis in some Lactuceae species

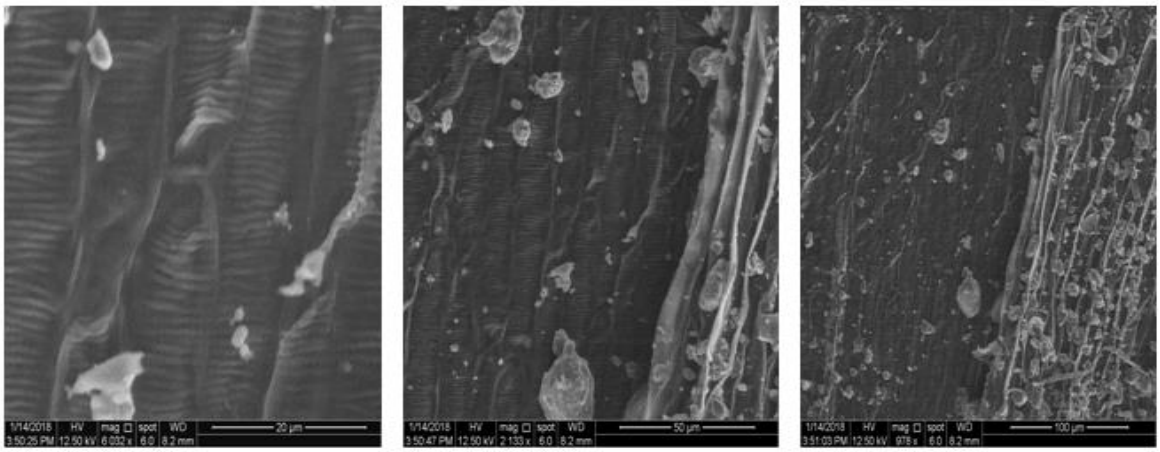


Leontodon lacinatus

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

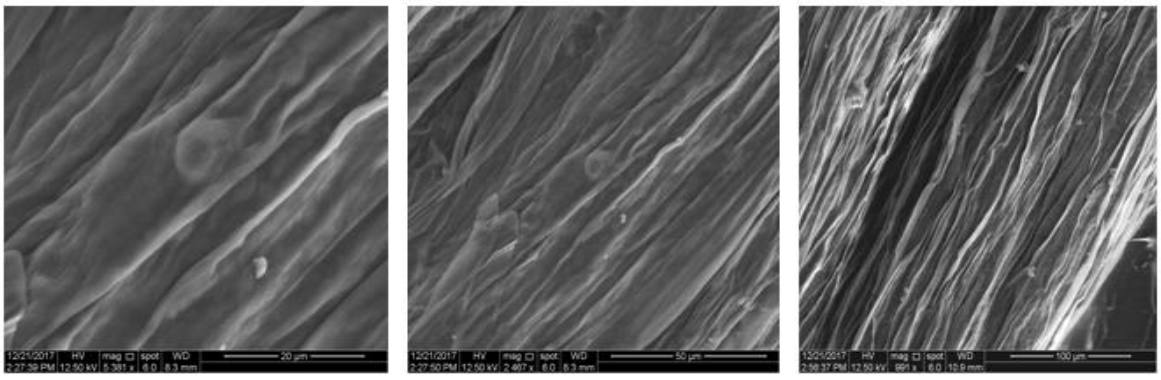


Picris babylonica



Reichardia tingitana

Figure 6: Scanning electron micrographs of ligule epidermis of Lactucae species Lactuceae species



Rhagadiolus angulosus

ISSN 1533-9211

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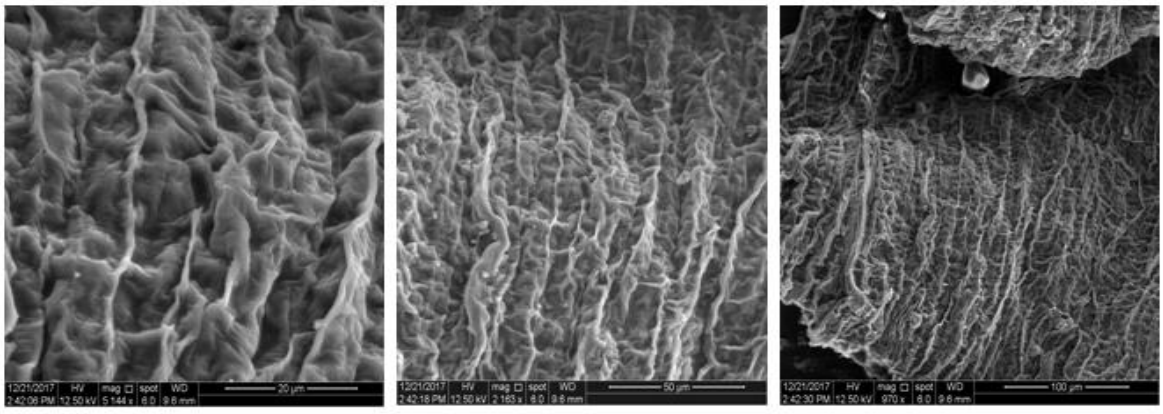
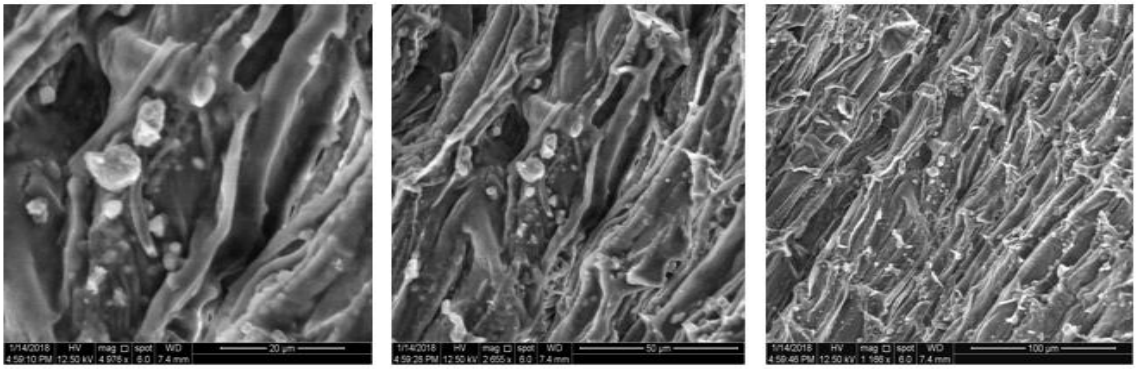
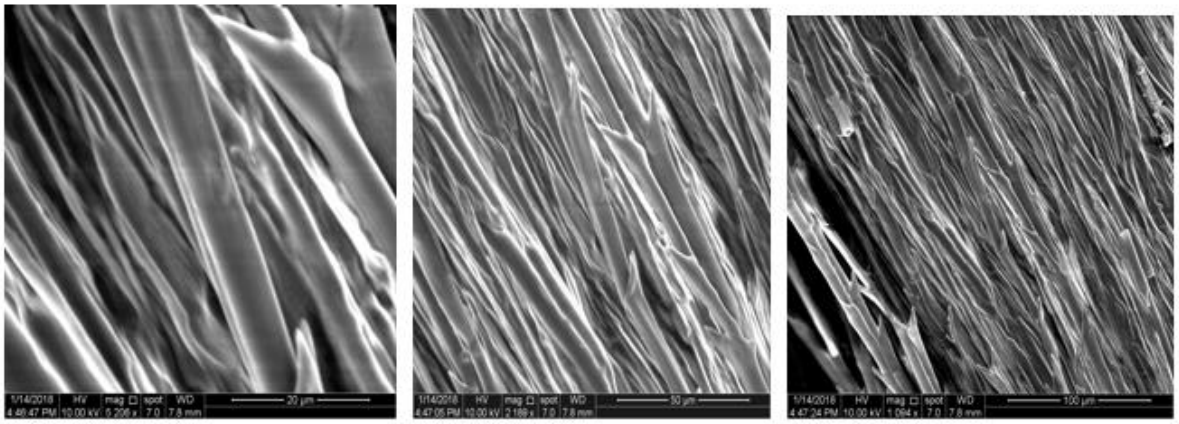


Rhagadiolus stellatus



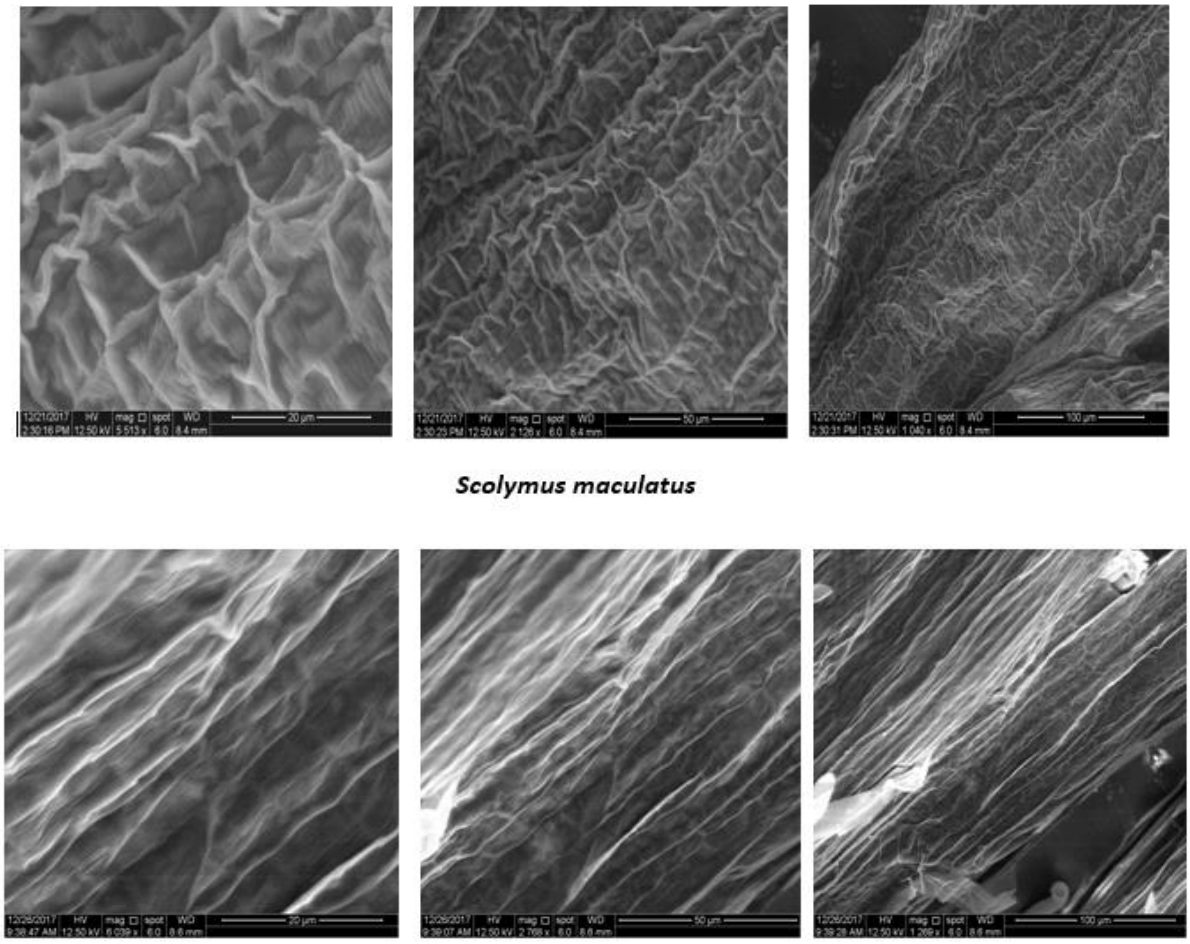
Scariola orientalis

Figure 7: Scanning electron micrographs of ligule epidermis of Lactuceae species



Scariola viminea

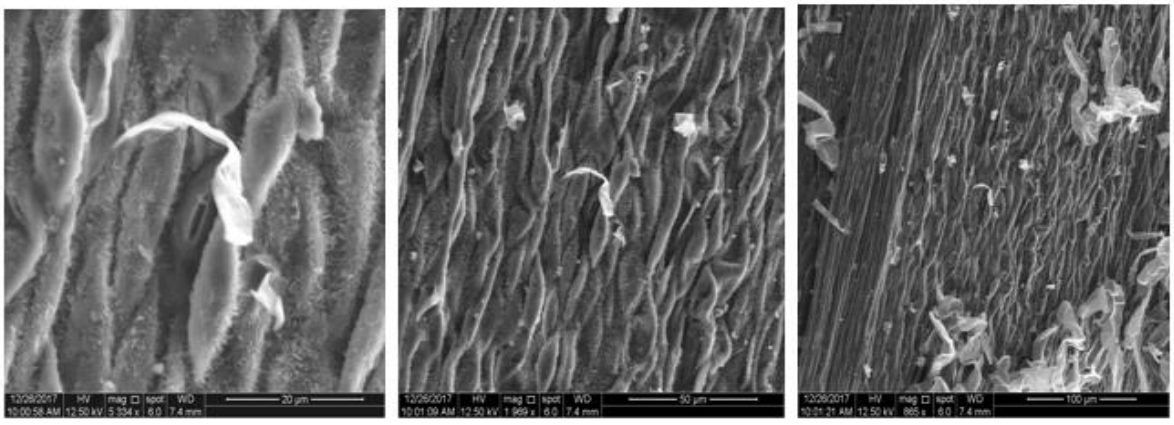
The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q



Scolymus maculatus

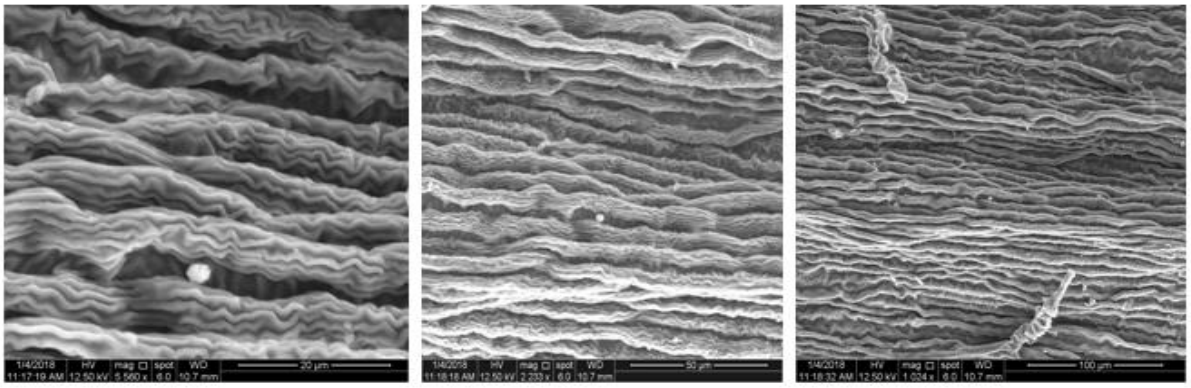
Sonchus oleraceus

Figure 8: Scanning electron micrographs of ligule epidermis in some Lactuceae species

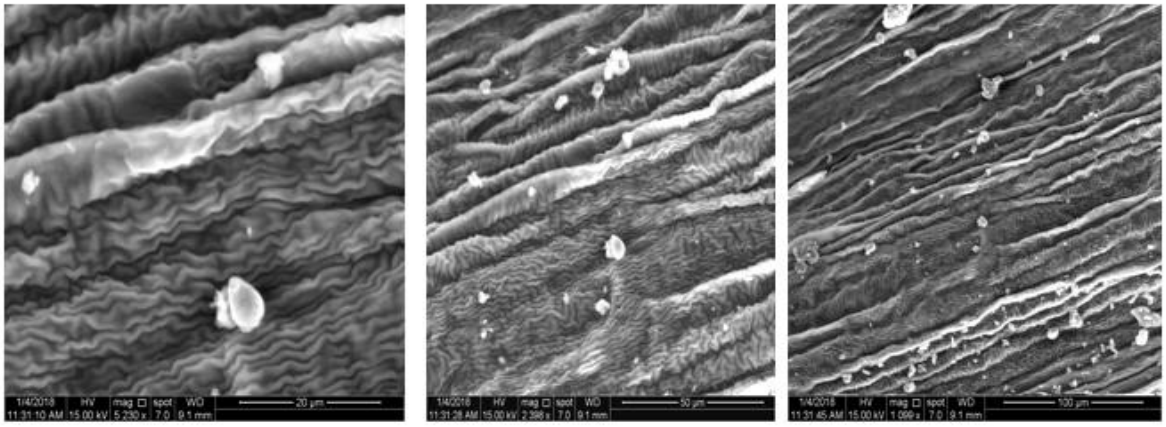


Streptorrhamphus tuberosus

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/R624Q

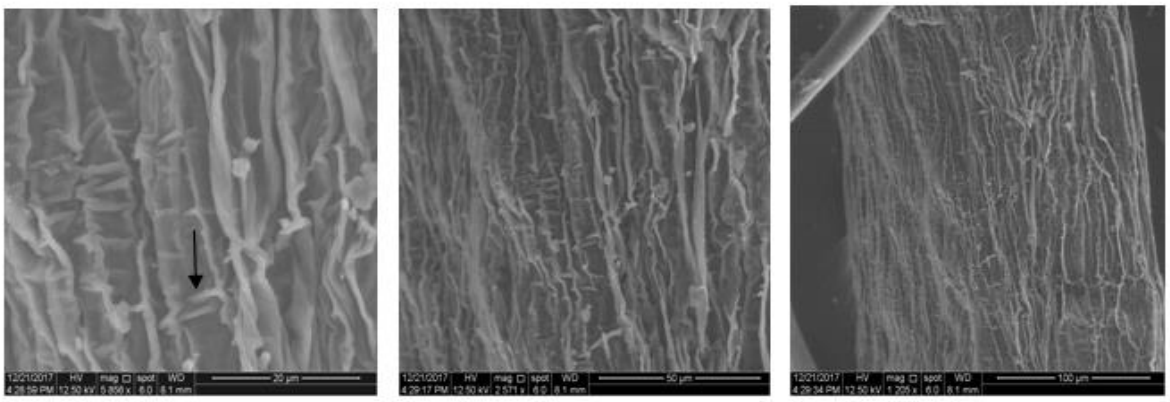


Tragopogon reticulatus



Tragopogon Longirostris

Figure 9: Scanning electron micrographs of ligule epidermis in some Lactuceae species



Urospermum picroides

Figure 10: Scanning electron micrographs of ligule epidermis in some Lactuceae species

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