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BOTANICAL STUDY AND FATTY ACIDS CHARACTERIZATION OF THE LEAVES OF *DYPSIS PEMBANA* (H.E. MOORE) BEENTJE &J. DRANSF. FAMILY ARECACEAE CULTIVATED IN EGYPT

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The Arecaceae family contains wide classes of phytoconstituents and possesses wide range of pharmacological Activities members of this family are used in folk medicine for treatment of several diseases. Dypsis pembana (H.E.Moore) Beentje& J. Dransf. is a palm tree growing in Tanzania belongs to family Arecaceae. In this study, a detailed macromorphological characters of stem, leaf, inflorescence, flower, fruit in addition to micromorphological characters of the leaves of Dypsis pembana Family Arecaceae cultivated in Egypt were studied for the identification of the plant in both entire and powdered form, in addition to characterization of fatty acids of the leaves by GC-MS analysis. Thorough analysis of the chromatogram of the n-hexane fraction and careful matching examination of the acquired spectra resulted in identification of 12 phytochemicals and revealed the presence of saturated fatty acids mainly as Palmitic acid methyl ester, Lauric acid methyl ester, Methyl tetradecanoate, Methyl stearate , Margaric acid methyl ester, Eicosanoic acid methyl ester and Capric acid methyl ester and polyunsaturated fatty acids mainly as Linolenic acid methyl ester and Linoleic acid methyl ester in addition to other phytochemicals as 2,2-Dimethylocta-3,4-dienal , 3,7,11-Trimethyl-2,4-dodecadiene and 3,7,11,15-Tetramethyl-2-hexadecen-1-ol.

Keywords: *Dypsis, Chrysalidocarpus, pembana, Arecaceae, Fatty acids.*

INTRODUCTION

The Arecaceae family is one of the largest families of monocotyledons and include about 181 genera and more than 2600 species restricted to tropical and subtropical regions, members of this family are monocot shrubs or palm trees[1]. This family contains several commercially important species as coconut, areca nut and date palms as well as large number of ornamental species[2].

Dypsis is a genus belonging to family Arecaceae, it is a palm of diverse habit, ranging from large canopy trees to small shrubs, distributed in Madagascar and neighboring islands and include 140 species[3].

The biological and phytochemical studies on genus Dypsis are scarce. Some species of Dypsis are used as antioxidant, antimicrobial, and hepatoprotective[4&5]. Phytochemical screening of some species of Dypsis (*D. lutescens and D. leptocheilos*) revealed presence of flavonoids, tannins, lignans, triterpenes, saponins and steroids [4,5]. *Dypsis pembana* (its synonym is *Chrysalidocarpus pembanus* H.E. Moore) is widely used as an ornamental plant and construction materials, hollowed-out stems to make pipes[6].

Reviewing the available current literature, nothing could be traced concerning botanical, phytochemical and biological studies of *D. pembana*, this prompted us to undertake a pharmacognostical investigation of this plant. This work describes the macro- and micromorphological characters of *D. pembana*. cultivated in Egypt in addition to analysis of the fatty acids content.

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Habitat

Dypsis pembana is native to Pemba Islands, Ngezi Forest Reserve, Tanzania, off the east coast of Africa[6].

Al-Abed Palm Garden, Cairo- Alexandria Desert Road.

Fig.1: Photo of *Dypsis pembana* palm. **(X=1/14)**

MATERIALS AND METHODS

Plant material

The fresh leaves of *Dypsis pembana* were collected in March 2020 from Al-Abed Palm Garden, Cairo- Alexandria Desert Road. The plant (Fig. 1) was identified by Dr. Trease Labib (consultant of plant taxonomy at Ministry of Agriculture and exit- director of El-Orman Garden, Giza, Egypt) and voucher specimen (Aun-Phg-0002016) is kept in Pharmacognosy Department Herbarium, Faculty of Pharmacy, Assiut University.

The leaves of *Dypsis pembana* were preserved in mixture of alcohol 70%: glycerin: water (1:1:1).

The leaves were air dried and reduced to powder of suitable particle size for microscopical examination.

Plant extraction

Fifty grams of the air-dried powdered leaves were extracted by maceration with *n*-hexane at room temperature till exhaustion. The extract was concentrated under reduced pressure and left to dry then weighed to give 5 g of *n*-hexane extract (scheme 1).

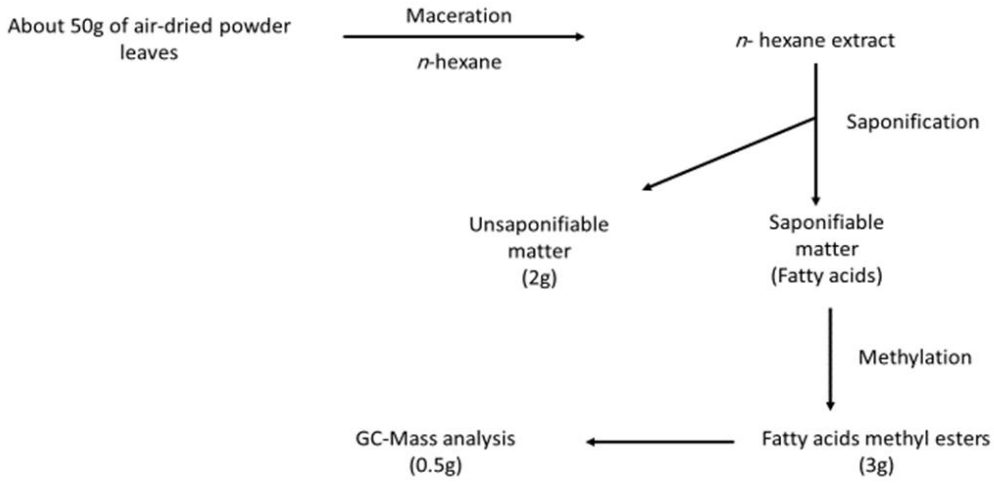
Isolation of fatty acids and preparation of their methyl esters

About 5 g of the *n*-hexane extract of the leaves was saponified by refluxing with 0.5 N alc. KOH for 3 hrs. on a boiling water bath. The major part of the alcohol present was distilled off and the concentrated extract was diluted with distilled water then extracted with several portions of ethertill exhaustion to give the unsaponifiable matter (2g). The alkaline aqueous solution (soap) that remained after removal of the unsaponifiable matter was acidified with 20% sulphuric acid in H_2O and the liberated fatty acids were extracted with ether. The combined ether extract was washed several times with distilled water till the washings were free from any acidity. The ether extract was dried over anhydrous sodium sulphate. The solvent was distilled off under reduced pressure to give a viscous residue of the free fatty acids, which have yellowish brown color. The residue was then subjected to methylation.

The obtained fatty acid residue was dissolved in 150 ml of 10% H_2SO_4 in MeOH and then refluxed for 4-6 hrs. The solvent was distilled off and the residue was taken in 10 ml distilled water, the aqueous solution was made alkaline with dilute ammonium hydroxide, where an oily layer was separated and extracted with ether till exhaustion. The ethereal extracts were combined anddistilled to give a yellowish-brown residue (3 g). A part of this residue (0.5g) was kept for further investigation (scheme 1)[7].

Gas chromatography mass spectrometry technique (GC-MS)

The sample was analysed on Thermo Scientific™ TRACE™ 1310 GC system, equipped with Electron Impact Ionization (EI) detector, TR-5 MS column (30 m x 0.32 mm i.d., 0.25 µm film thickness) was used. the program of analysis started with 60 °C for 1 min. then rising at 4.0 °C/min to 240 °C and held for 1min. the detector and injector temperature were kept at 210°C.



Scheme 1: Extraction and preparation of fatty acids methyl esters.

RESULTS AND DISCCUSSION

I - Macromorphology of *Dypsis pembana*:

The stem (Fig. 2)

Dypsis pembana stem is slender, erect, clustering, sometimes solitary, spinless, greenish, smooth cylindrical and there is a green bulging crown shaft at stem apex. Its tall reaches about 4-12 meters height, 6-15 cm in diameter, internode to 24 cm long and strongly ringed with leaf scars.

https://www.palmpedia.net/wiki/Dypsis_pembana

Fig. 2: Photo of stems of *Dypsis pembana.* **(X=1/29)**

The leaves (Fig. 3)

Dypsis pembana is a feather palm with reduplicate segment. The leaves are regularly pinnate (when the leaflets are regularly spaced from the rachis). The leaves up to 2 meters in length. The leaf is composed of leaf sheath, rachis and leaflets. Leaf sheath is waxy green, tubular shape about 50-60 cm long. Rachis is light green and up to 1.5 cm wide.The leaflets are dark green, linear lanceolate with waxy surface and may be opposite, subopposite and alternate. Leaflets are 40-50 on each side of the rachis, regular, arching, the leaflets on opposite side of the rachis of 90° with each other, and about 20-100 cm in length, 2-10 cm in width. The midrib is prominent adaxially.

Fig. 3: photo of the leaf and leaflets of *Dypsis pembana*. **(X=1/4)**

The inflorescence (Fig. 4)

Dypsis pembana is monoecious plant, the inflorescence is interfoliar, branched to 3-4 orders with spreading branches, lengthening in fruit by some 40%; peduncle 60 cm long, stout, nearly flattened, densely reddish tomen-tose,

distally curving through 90°; prophyll > 30 cm, 5 cm wide, glabrous, dull waxy; peduncular bract 30-55 cm long, splitting over its length, rusty-pubescent or glabrous and waxy, beaked for 2-3 cm, deciduous; first order branches slightly reddish-pubescent but glabrescent, with up to 15 second order branches; rachillae glabrous, 11-19 cm long, 1-2 mm diam.; triads distant; rachilla bract 0.5-0.7 mm, obtuse to acute. Flowers are very small not seen[3].

https://www.palmpedia.net/wiki/Dypsis_pembana

Fig. 4: photo of inflorescences of *Dypsis pembana.* **(X=1/50)**

The staminate flowers

Only known from buds, with sepals 1.3-1.6 x 1.4-1.8 mm, concave, proximally gibbous, keeled, ciliolate; petals 2.3-2.8 × 1.5-1.8 mm; stamens 6, slightly biseriate, offset 0.2 mm, the filaments 1.4-1.5 mm and thin-cylindrical, the anthers 1.3-1.5 × 0.4-0.7 mm; pistillode columnar, 1.8-2.8 × 0.6 mm[3].

The pistillate flowers

Unknown at anthesis, the petals in fruit 2-2.6 mm long[3].

The fruit (Fig. 5A&5B)

Oblong-ovoid bright red-crimson fruits 12-15 x 5-7 mm. Epicarp is smooth, thin fleshy mesocarp and Fibrous endocarp[3].

The seed (Fig. 5C)

The seeds are ovoid in shape, yellowish brown in color, characterized by homogeneous endosperm 10.5-11x5-5.5mm. Seed harvested for ornamental plantings[3].

https://www.palmpedia.net/wiki/Dypsis_pembana

Fig. 5: photo of fruits and seeds of *Dypsis pembana*.

II-Micromorphology of the leaves

a-The leaflet (Fig. 6-11)

The lamina (Fig. 6A,6B,7A,7B,8,9 and 10)

A transverse section through the lamina in the midrib region is planoconvex in outline. Several vascular bundles transverses the mesophyll, the largest one is that in the midrib region. The leaflet is dorsiventral, with one row of columnar palisade cells of variable sizes underlying the upper epidermis containing chloroplasts. Palisade cells are interrupted in the main rib region with a small layer of chlorenchyma followed by a massive sclerotic layer.

Mesophyll is parenchymatous, with irregular shaped cells usually polyhedral containing chloroplasts and small closed vascular bundles. Mesophyll contains small groups of fibers distributed randomly. Hairs are not observed.

Transverse section near the top of the leaflet in the midrib region showed central closed vascular bundles surrounded by massive fibrous sheathes that are fused together to form a sclerotic cylinder surrounding the central vascularized parenchyma.

Transverse section near the base of the leaflet in the midrib region showed peripheral and central closed vascular bundles, the peripheral ones have massive fibrous sheathes that are fused together to form a sclerotic cylinder surrounding the central vascularized parenchyma.

The central vascular bundle is large with phloem divided into 2 separate strands by sclerotic partition, while xylem sheath is mostly parenchymatous. The ground tissue is parenchymatous, rounded, some cells containing raphides of calcium oxalates, rounded starch granules (identified by I_2) and some of these cells are pitted.

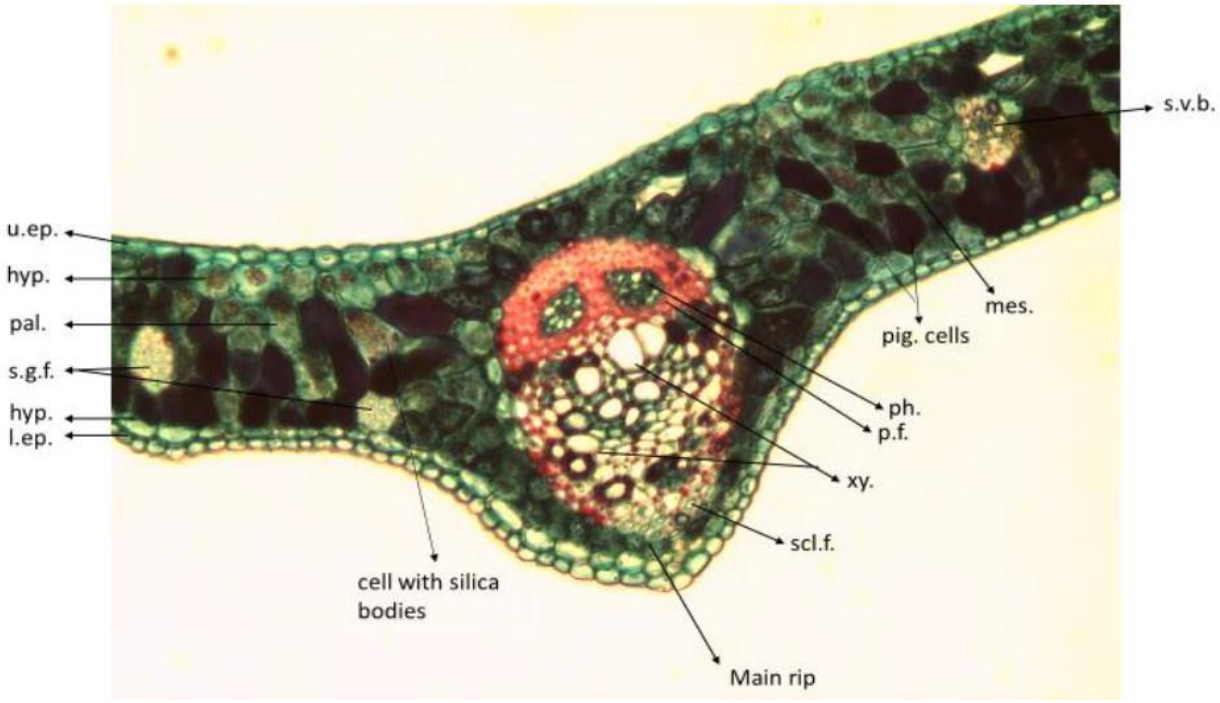


Fig. 6A: photo of T.S. near the top of the leaflet. **(X= 40)**

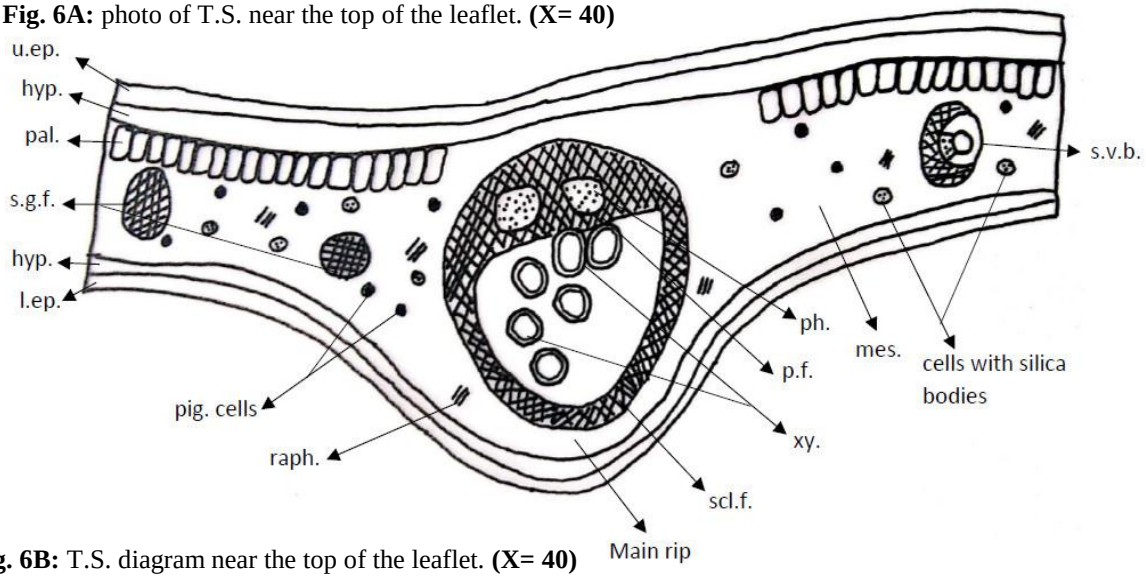


Fig. 6B: T.S. diagram near the top of the leaflet. **(X= 40)**

hyp., hypodermis; l.ep., lower epidermis; mes., mesophyll; pal., palisade; p.f., pericyclic fiber; ph., phloem; pig. cells., pigment cells; raph., raphades of Caox; scl.f., sclerenchymatous fibers; s.g.f., small group of fibers; s.v.b., small vascular bundle; u.ep., upper epidermis; xy., xylem.

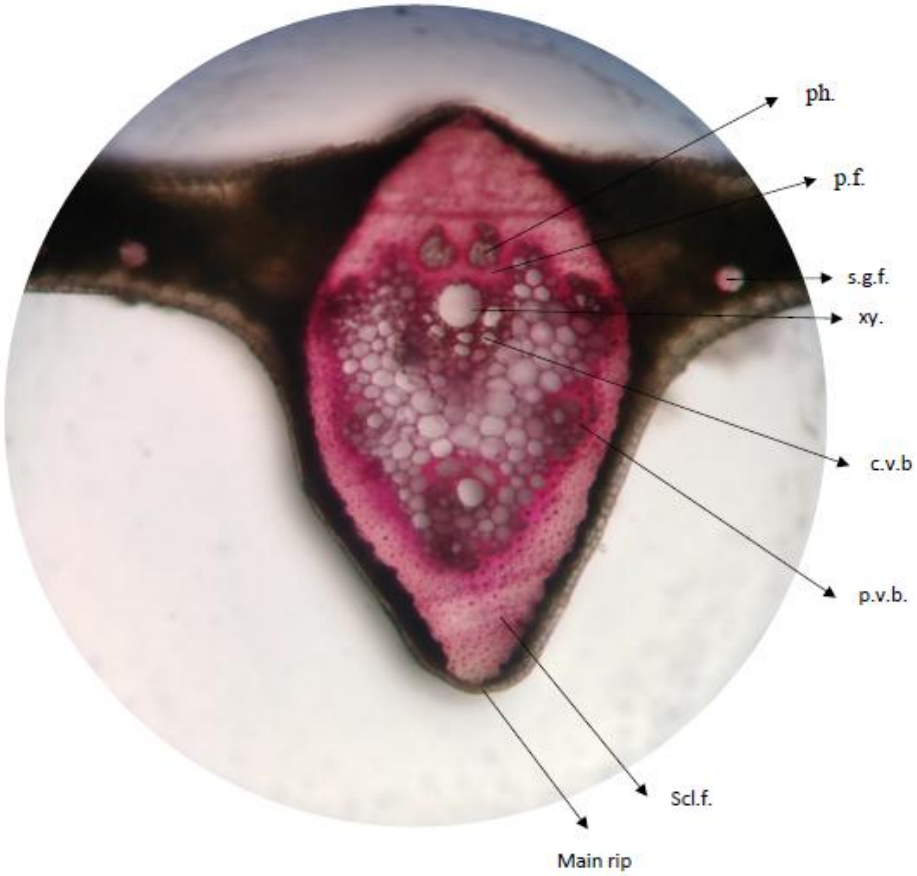


Fig. 7A: photo of T.S. near the base of the leaflet. **(X= 40)**

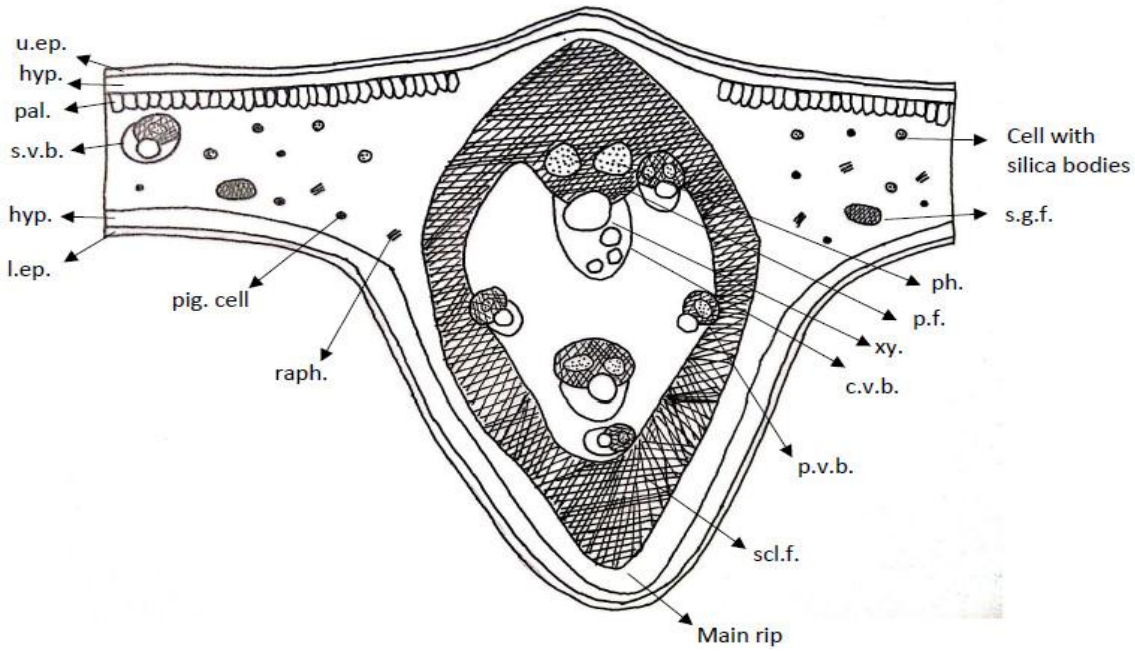


Fig. 7B: T.S. diagram near the base of the leaflet. **(X= 40)**

c.v.b., central vascular bundle; hyp., hypodermis; l.ep., lower epidermis; mes., mesophyll; pal., palisade; p.f., pericyclic fiber; p.v.b., peripheral vascular bundle; ph., phloem; pig. cells., pigment cells; raph., raphades of Caox; scl.f., sclerenchymatous fibers; s.g.f., small group of fibers; s.v.b., small vascular bundle; u.ep., upper epidermis; xy., xylem.

The upper epidermis: (Fig. 8 & 9)

The upper epidermis consists of one row of square to sub rectangular cells as seen in transverse section, while in surface view, they appear rhombohedral or spindle shape thick-walled cells, covered with thick cuticle and few dumbbell shaped stomata are present which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls. Hairs are absent.

The lower epidermis: (Fig. 8 & 10)

The lower epidermis consists of one row of square to cubical cells in transverse section, while in surface view they appeared rhombohedral, less spindle more regular shape thick-walled cells, covered with smooth thin cuticle and numerous dumbbell shape stomata are present which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls. Hairs are absent.

The Hypodermis:

one layer of sub-rectangular parenchyma separating the upper epidermis from the palisade.

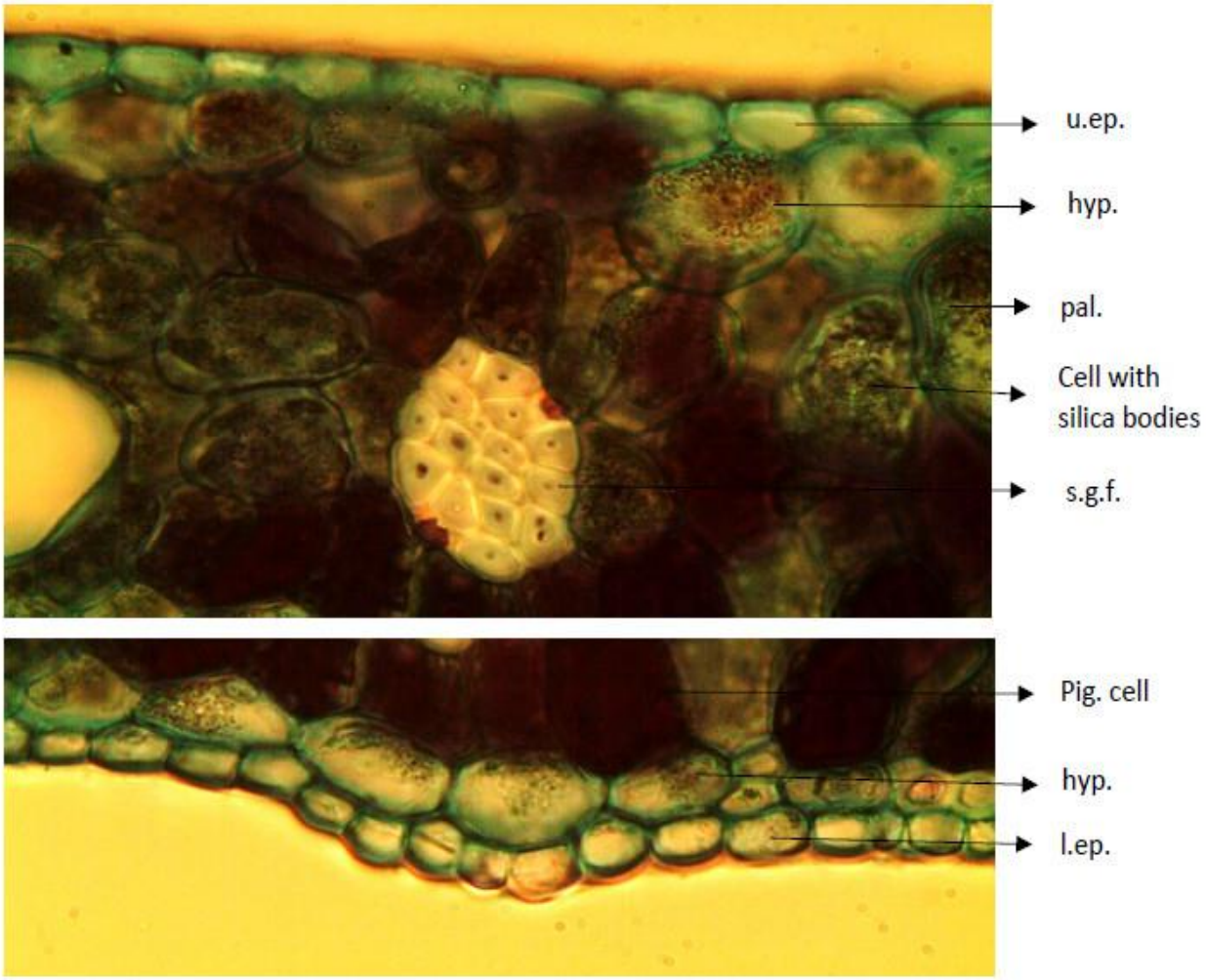


Fig. 8: photo of detailed T.S. in the lamina of the leaflet. **(X= 400)**
hyp., hypodermis; l.ep., lower epidermis; pal., palisade; pig. cell., pigment cell; u.ep., upper epidermis.

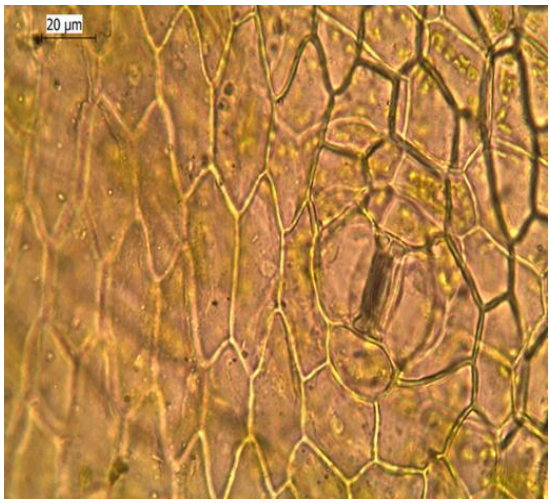


Fig. 9: photo of upper epidermis of the leaf of *Dypsis pembana*. **(X= 400)**

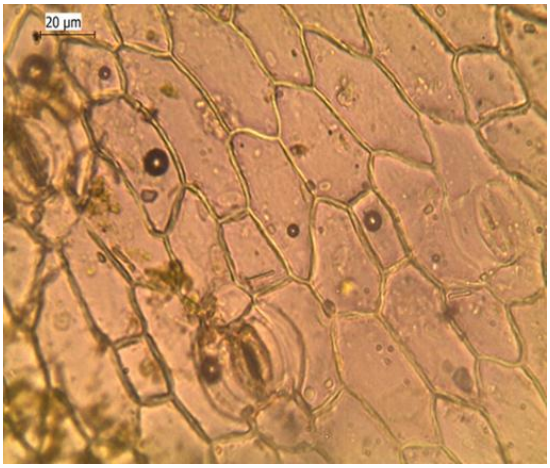


Fig. 10: Photo of lower epidermis of the leaf of *Dypsis pembana.* **(X= 400)**

The mesophyll (Fig. 8)

The leaflet is dorsiventral, with one row of columnar palisade cells of variable sizes underlying the hypodermis. the upper epidermis containing chloroplasts. Palisade cells are interrupted in the main rib region with a small layer of chlorenchyma followed by a massive sclerotic layer.

The rest of mesophyll is spongy cells, with irregular shaped cells usually polyhedral containing chloroplasts and shows wide intercellular spaces and through which run small closed vascular bundles. Mesophyll contains small groups of non-vascular fibrous strands, raceme to spherical shaped distributed randomly which is characteristic for several species of family Arecaceae[8].

Mesophyll contains pigment cells, expansion cells, raphides of Ca-ox and rounded starch grains (identified by I_2).

The ground tissue (Fig. 11)

The ground tissue of the central region consists of oval to rounded parenchyma cells that are surrounded by massive sclerotic zone. Some of these cells are pitted, and some contain raphides of calcium oxalate and other contain rounded starch granules.

The vascular system (Fig. 11)

The transverse sector showed that the vascular system which is atactostele type with scattered closed vascular bundles. Small vascular bundles are present within the mesophyll. In the main rib region, peripheral vascular bundles have massive fibrous sheathes that are fused together to form a sclerotic cylinder surrounding the central vascularized parenchyma.

The central vascular bundle is large with phloem divided into 2 separate strands by sclerotic partition, while xylem sheath is mostly parenchymatous. The xylem consists of one, two or three wide lignified xylem vessels, tracheids, fibers and wood parenchyma. The xylem vessels showed spiral, sclariform, reticulate and pitted thickening. The wood parenchyma is rectangular to sub-rectangular cell with thickened lignified wall and numerous pits. The phloem consists of sieve tubes with compound sieve plates and some companion cells.

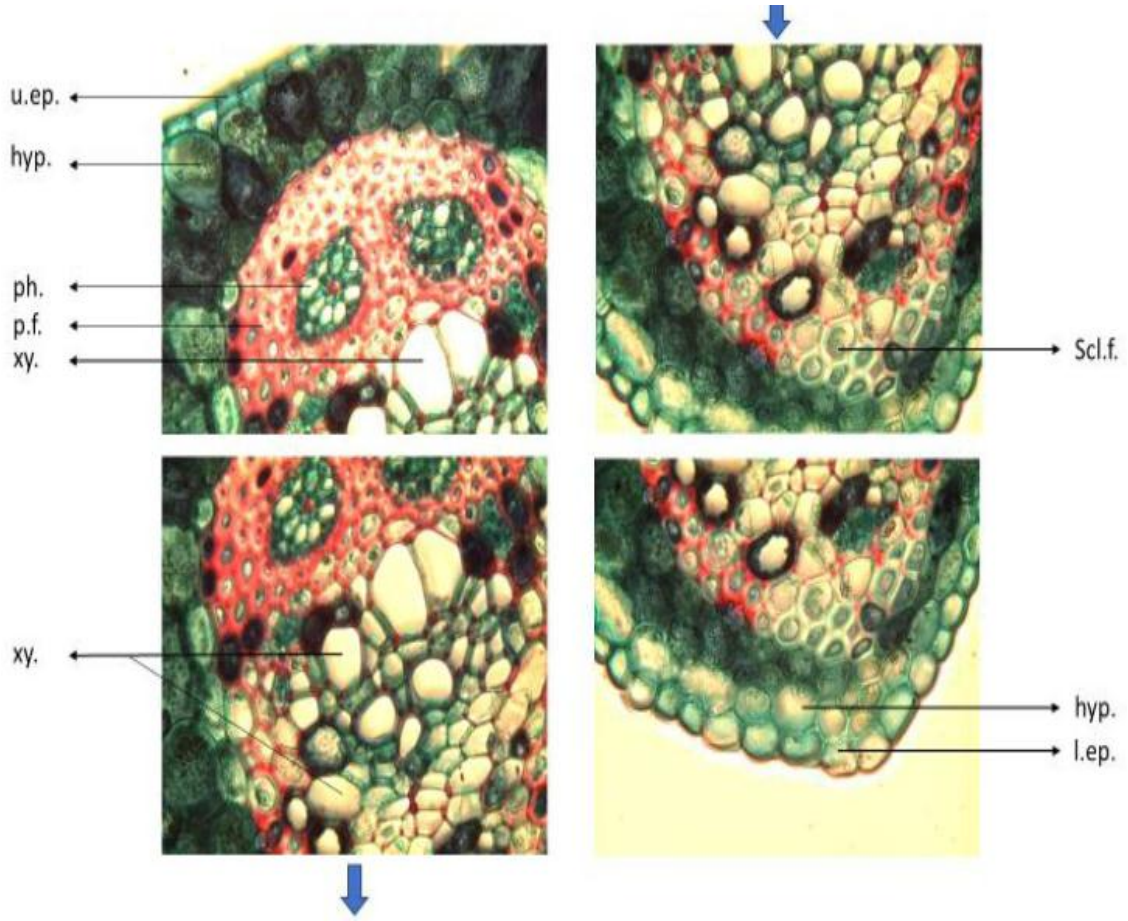


Fig. 11: photo of detailed T.S. in the main rib of the leaflet. **(X= 400)**

hyp., hypodermis; l.ep., lower epidermis; p.f., pericyclic fiber; ph., phloem; scl.f., sclerenchymatous fibers; u.ep., upper epidermis; xy., xylem.

b- The rachis (Fig. 12,13A,13B and 14)

The transverse sector in the rachis is nearly quadrangular to triangular. The epidermal cells consist of one row of square to cubical cells in transverse section, while in surface view the cells appeared as rectangular to sub-rectangular, thick-walled cells covered with smooth thin cuticle and few dumbbell shaped stomata are present which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls. Hairs are absent.

Hypodermis is one layer usually surrounding continuous narrow layer of chlorenchyma which usually contains numerous raphides of calcium oxalate. Peripheral vascular bundles are with massive sheathes of sclerenchymatous fibers that are fused together to form a continuous sclerotic zone. The vascular bundles are scattered with phloem divided into 2 separate strands by sclerotic partition, while the xylem sheath is mostly parenchymatous. The xylem consists of one, two or three wide lignified xylem vessels, tracheids, fibers and wood parenchyma. The xylem vessels showed spiral, sclariform, reticulate and pitted thickening. The wood parenchyma is rectangular to sub-rectangular cell with thickened lignified wall and numerous pits. The phloem consists of sieve tubes with compound sieve plates and some companion cells.

Scattered raphides of calcium oxalate and rounded starch granules are distributed within the ground parenchyma**.**

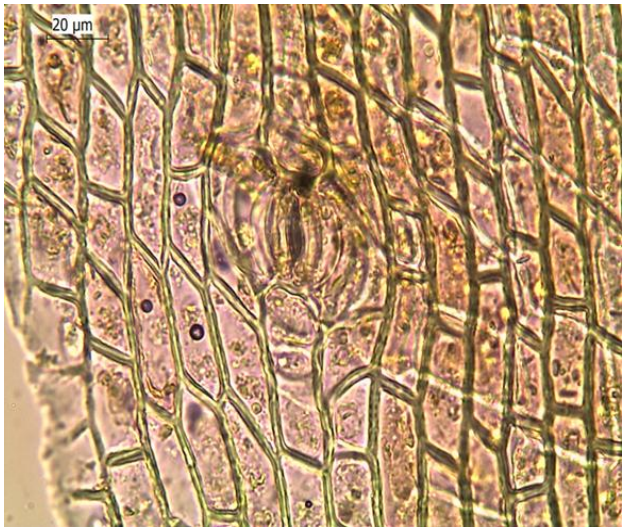


Fig. 12: Photo of epidermis of rachis of the leaf of *Dypsis pembana.* **(X= 400)**

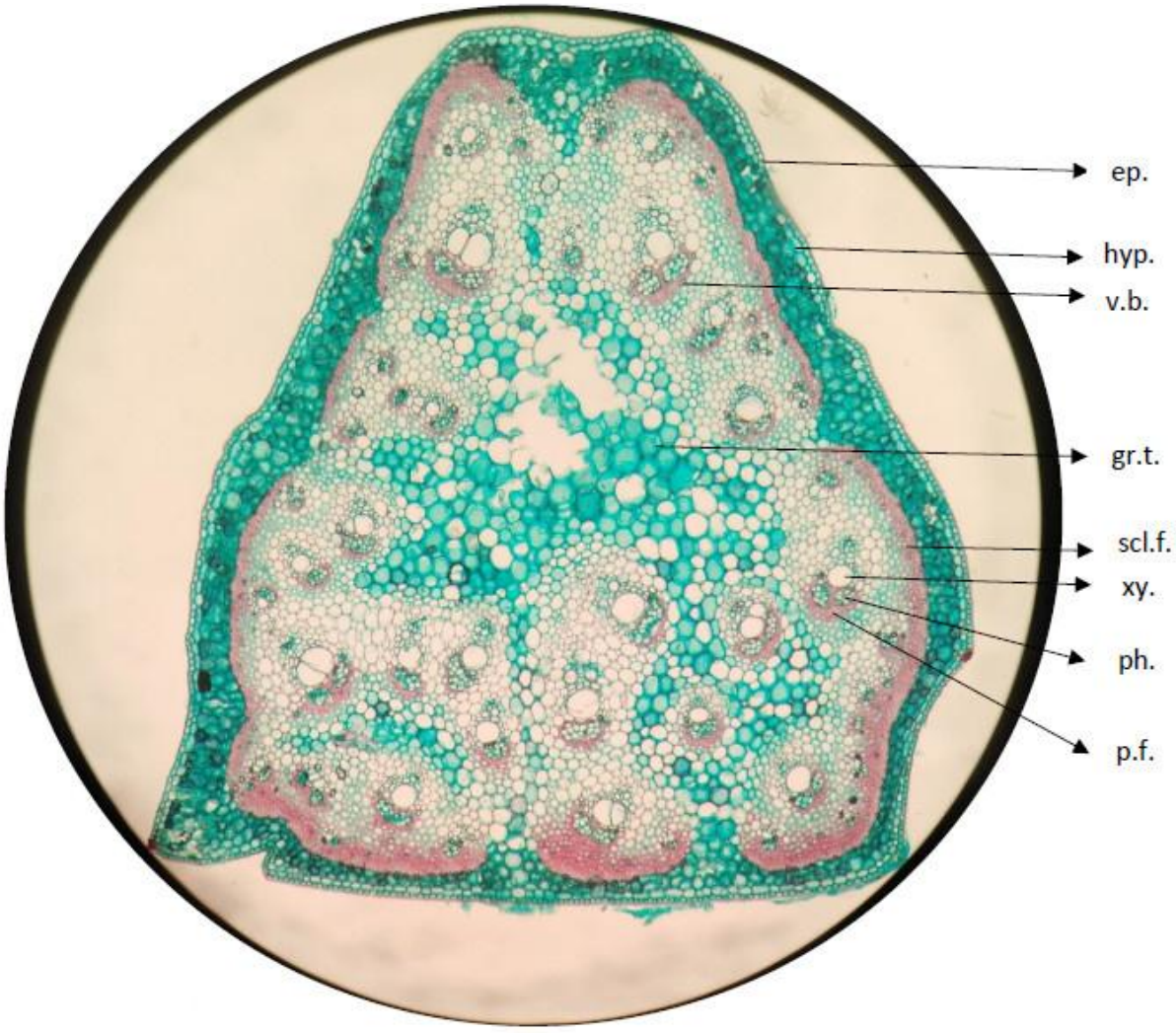


Fig. 13A: Photo of T.S. in the rachis. **(X= 40)**

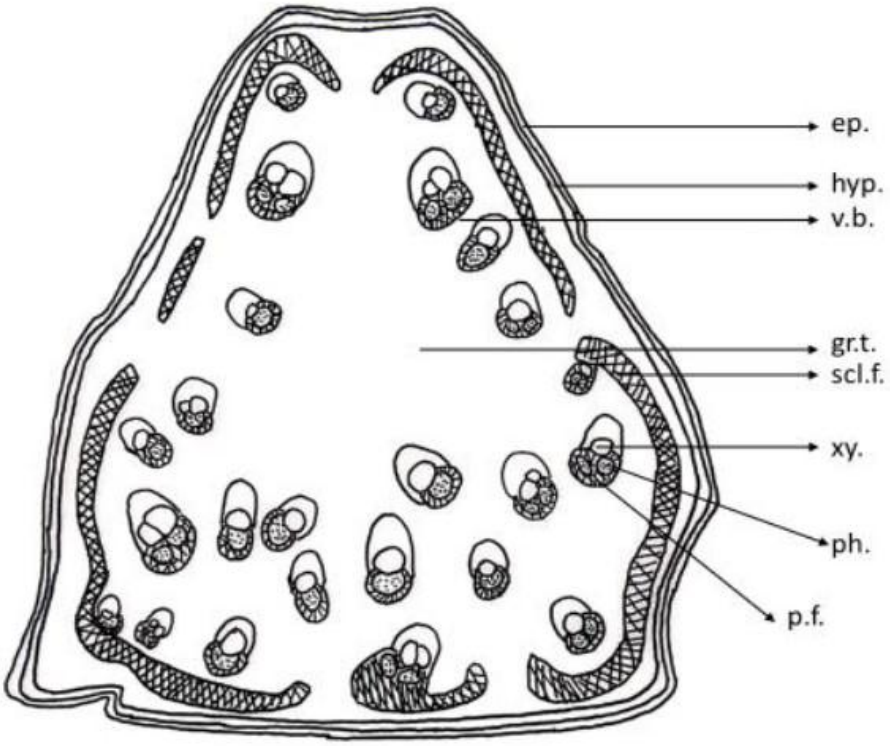


Fig. 13B: T.S. diagram of the rachis. **(X= 40)**
ep.,epidermis; gr.t., ground tissue; hyp., hypodermis; p.f., pericyclic fibers; ph., phloem; scl.f., sclerenchymatous fibers; v.b. vascular bundle; xy., xylem. .

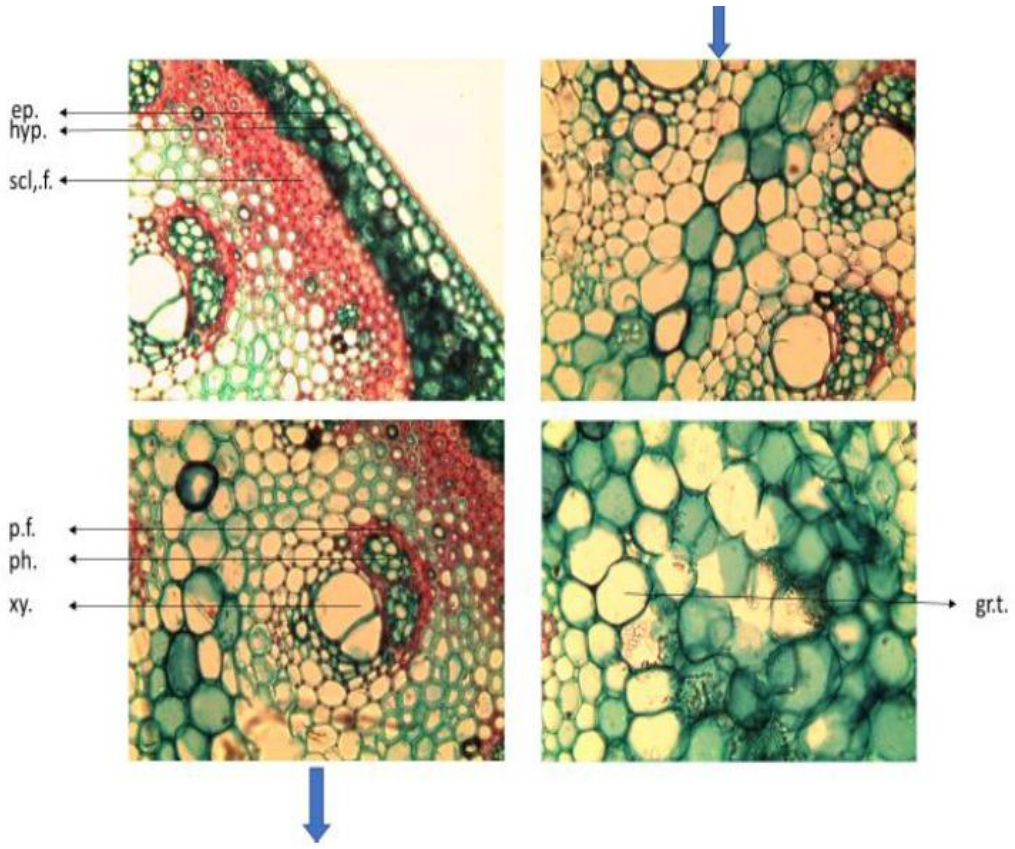


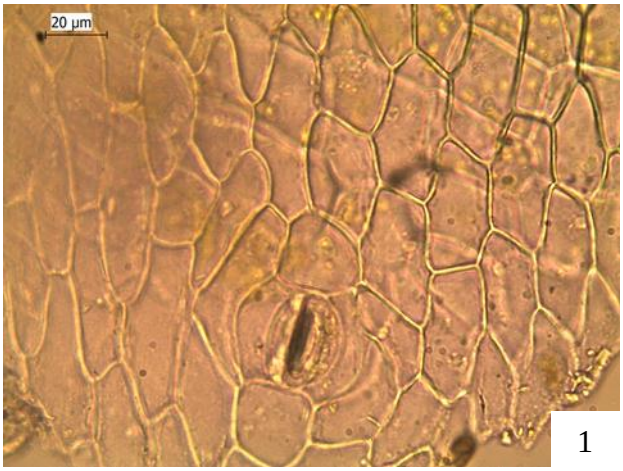
Fig. 14: photo of detailed T.S. in the rachis. **(X= 400)**
ep.,epidermis; gr.t., ground tissue; hyp., hypodermis; p.f., pericyclic fibers; ph., phloem; scl.f., sclerenchymatous fibers; v.b. vascular bundle; xy., xylem.

The powder leaf (Fig. 15)

Physical properties

The powdered leaf is pale green in color, with fibrous touch, faint disagreeable odor and slightly disagreeable taste. Microscopical examination of *Dypsis pembana* powder showed the following fragments:

1. Fragments of the upper epidermis showing rhombohedral or even spindle shaped cells, longitudinally elongated, the cells have thick walls and covered with thick cuticle, with few dumbbell shaped Stomata which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls. Hairs are absent.
2. Fragments of the lower epidermal cells that are less spindle and more regular in shape, the cells have thick walls and covered with smooth cuticle with numerous dumbbell-shaped stomata which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls, no hairs are observed.
3. Fragments of the rachis epidermal cells they appeared rectangular to sub-rectangular, thick-walled cells with smooth thin cuticle and few dumbbell shaped stomata are present which are tetracytic type, surrounded by 4 subsidiary cells (2 small terminal cells and 2 large lateral cells) with straight anticlinal walls. Hairs are absent.
4. Fragments of lignified xylem vessels having simple pitted, spiral, reticulate and scalariform thickenings.
5. Fragments of needle crystals of Ca ox. Either free or usually in bundles forming raphide sac (5a-b).
6. Fragments of tracheids, having wide lumins with thick lignified and simple pitted walls.
7. Fragments of fibrotracheids that have one broad end and other tapering one, with thick lignified walls and moderately wide lumens and numerous pits.
8. Fragments of wood parenchyma of variable sizes, usually sub rectangular cells with thick lignified walls, having moderately wide lumens and numerous pits.
9. Fragments of wood fibers, lignified, elongated with tapering ends, thick walled with narrow lumens (9a-c).
10. Fragments of spindle shape pericyclic fibers with narrow lumins and moderately thick lignified walls, sometimes with dentate margin and tapering apex (10a-b).
11. Fragments of pigment cells, usually polyhedral to rounded cells containing reddish brown pigments.
12. Fragments of green columnar palisade cells.
13. Fragments of parenchyma cells contain silica bodies.
14. Fragment of parenchyma cells contain starch granules (mount with water).



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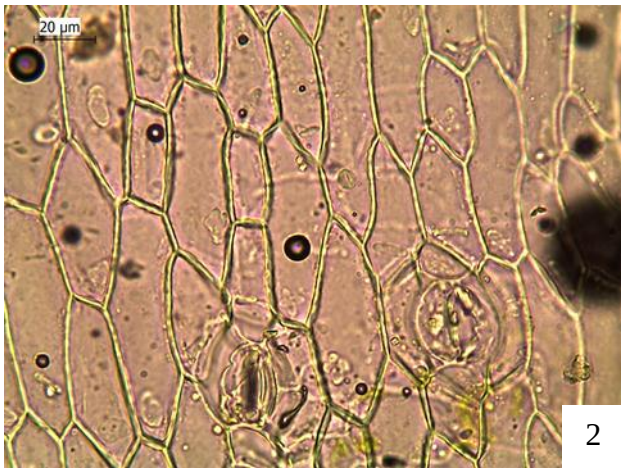

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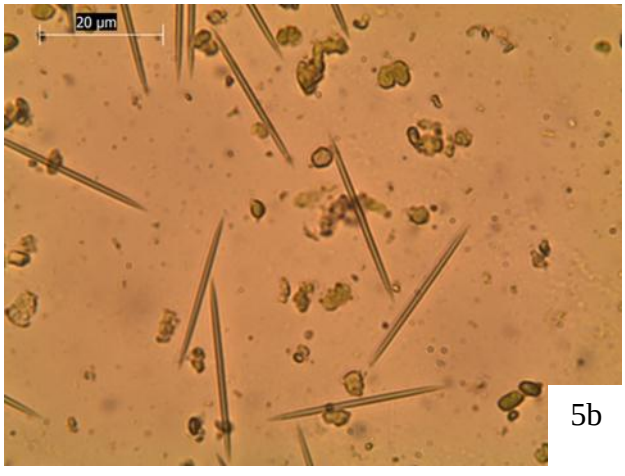

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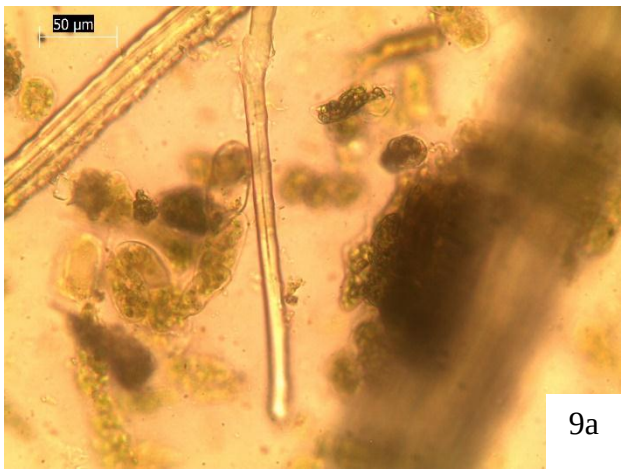

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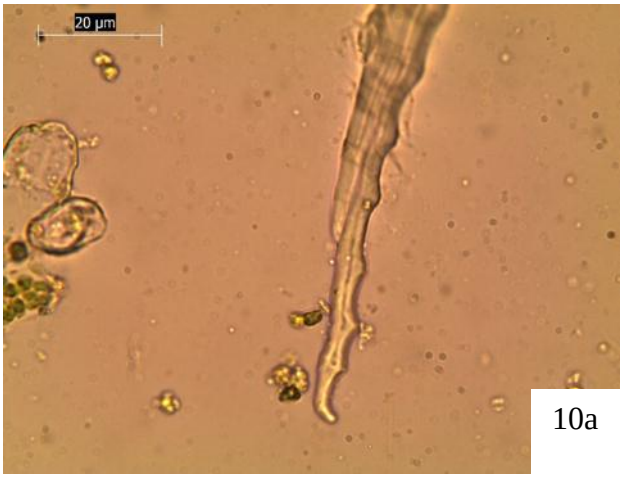

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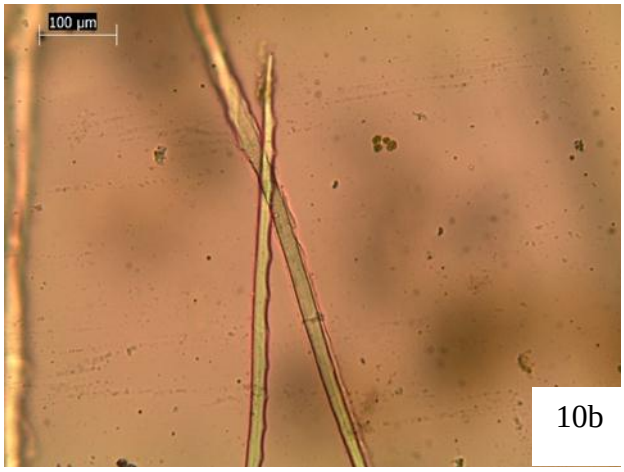
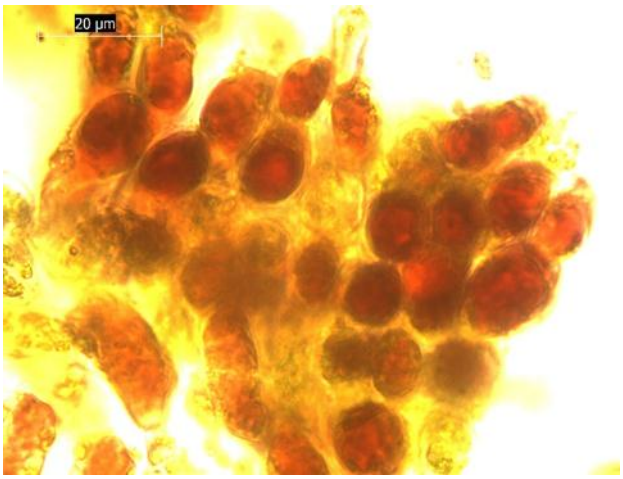
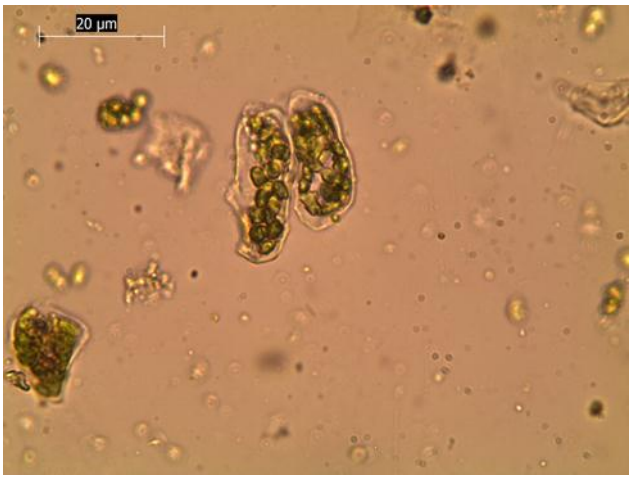


10b





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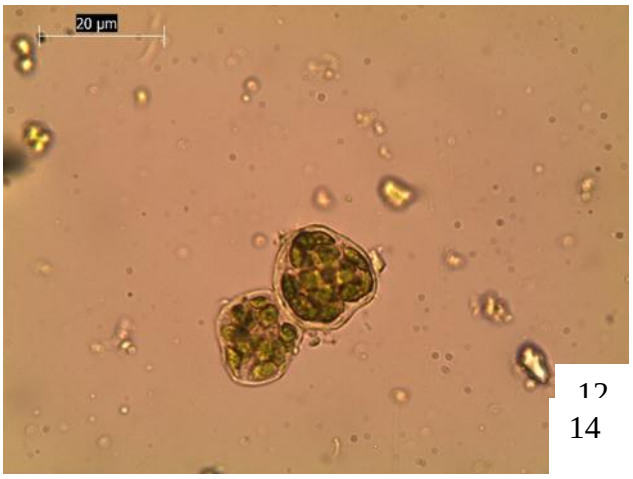

12
14

Fig. 15: photos of the powder and isolated elements of the leaf. **(X= 400 except 6,7 and 9 X= 200)**

1, upper epidermis; 2, lower epidermis; 3, epidermis of rachis; 4, xylem vessels; 5a,5b, needles and raphides of Caox; 6, tracheid; 7, fibrotracheid; 8, wood parenchyma; 9a,9b,9c, wood fibers; 10a,10b, pericyclic fibers; 11, pigment cells; 12, palisade cells; 13, parenchyma cells contain silica bodies; 14, parenchyma cells contain starch granules.

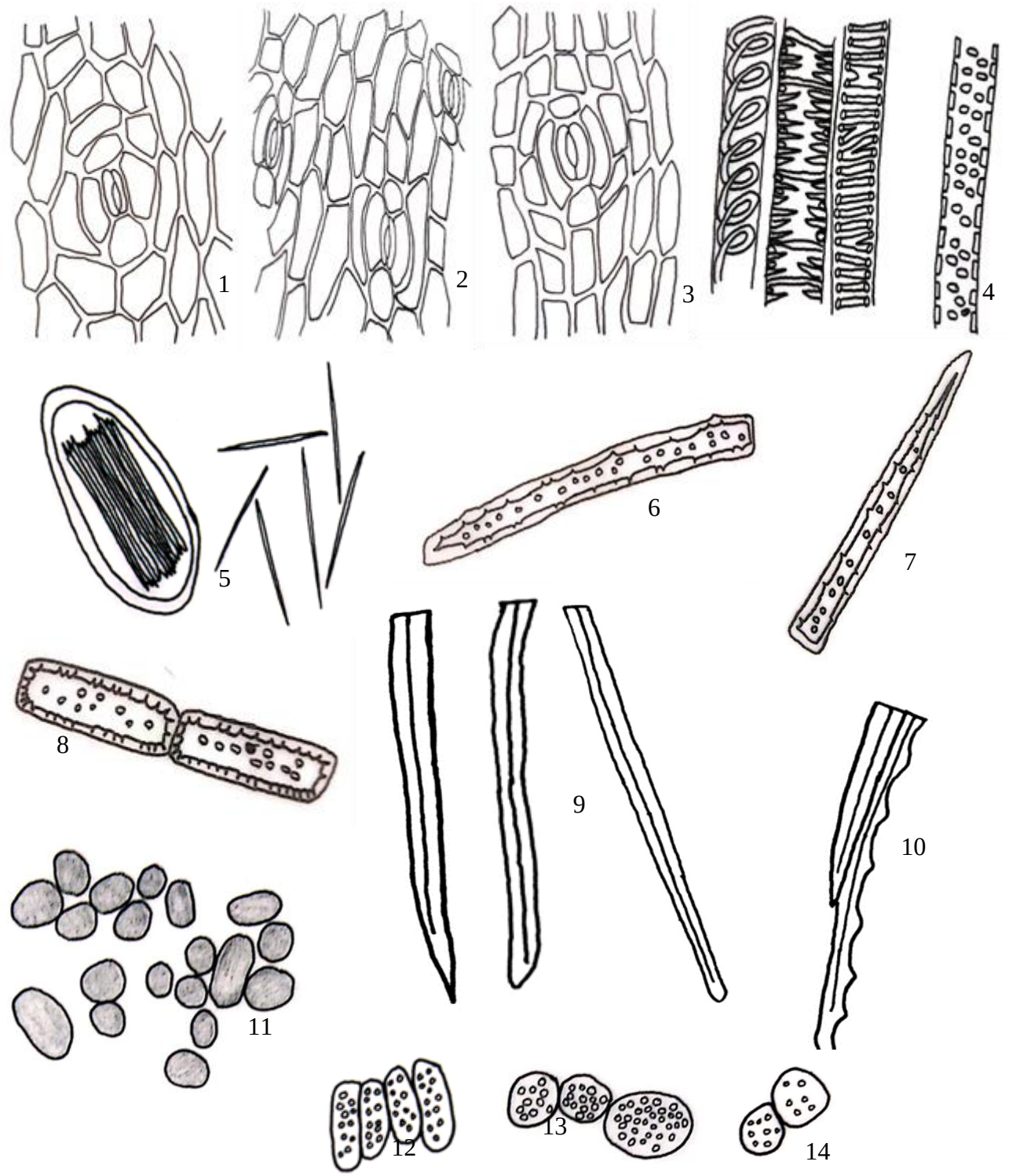

Fig. 16: powder and isolated elements of the leaf. **(X= 400 except 6,7 and 9 X= 200)**

1, upper epidermis; 2, lower epidermis; 3, epidermis of rachis; 4, xylem vessels; 5, needles and raphides of Caox; 6, tracheid; 7, fibrotracheid; 8, wood parenchyma; 9, wood fibers; 10, pericyclic fibers; 11, pigment cells; 12, palisade cells; 13, parenchyma cells contain silica bodies; 14, parenchyma cells contain starch granules.

Table 1: Microscopical measurements of the leaf of *D. pembana* (in microns).

Item	length	width	diameter	height
Upper epidermis	47.1-70.3-85.4	11.7-16.5-19.6		4-6.3-8
Lower epidemis	33.8-62.1-77.4	15.1-21.9-21.2		5.6-7-10
Rachis epidermis	24.1-35.7-51	13.2-11.4-10.8		4-6.9-8
Stomata	27-30.5-32.6	17.2-18.6-19.5		
Terminal subsidiary cells	4-7.3-9	8-13.6-18.3		
Lateral subsidiary cells	35.9-59-70	10-14.5-19.6		4-6.5-9
Hypodermis			10.5-15-17.5	
Palisade cells	60-85-110	30-37.6-47		
Parenchyma			13-16.6-28.5	
Acicular Ca Ox	26.5-28.4-35.7			
Pericyclic fibers	500-720-900	13.32-18.6-22.6	5-10.5-14	
Xylem parenchyma	60-72.1-80.5	25-36.8-50		
Xylem vessels			20-35-58	
Wood fibers	450-630-800		5-10.5-28.5	
Tracheids	200-250-293.5	23.5-25-27.4		
Fibrotracheids	185-210-280	22.5-25-28.5		
Parenchyma containing silica bodies			12.5-17.5-25.4	
Pigment cells			10-22.1-30.5	

III-Investigation of fatty acids profile

The GC chromatogram of the analysed sample is shown in (Fig. 17). The components were identified by comparing their retention times and mass fragmentation patterns with those reported ones through the equipment's library. Each search produces a “hit list” of three library spectra, which is ranked by similarity to the target spectrum according to a computed “match factor”. Identification of components was achieved based on the highest spectrum match factor. Some peaks that do not match corresponding peaks in a library spectrum were ignored and others were considered as impurities to maintain high reliability level and refine the results. The identified components, their base peaks, retention times, and relative percent were listed in (Table 2).

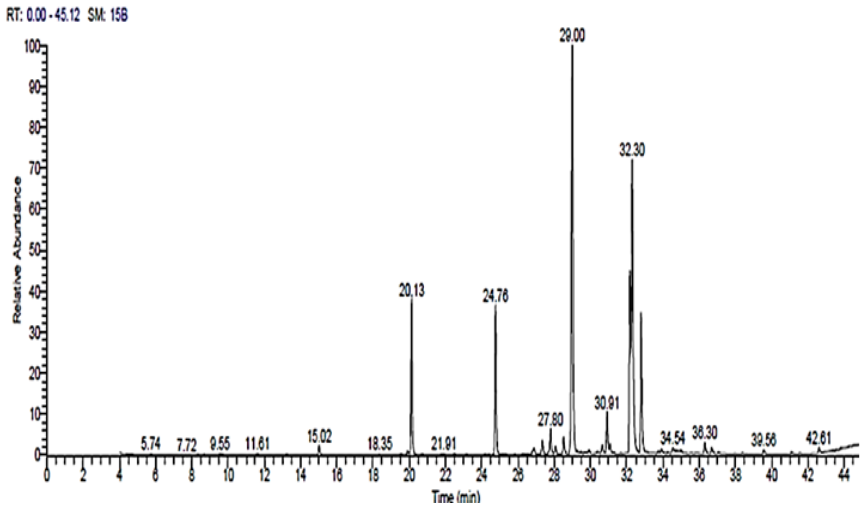

Fig. 17: GC chromatogram of the fatty acid methyl esters.

Table 2: A list of principal fatty acid methyl esters and other volatile phytochemicals detected by GC-MS analysis of *n*-hexane fraction.

No.	Component name	RT (min)	Base peak m/z	Relative area %
1	Decanoic acid, methyl ester (Capric acid methyl ester)	15.02	186	0.57
2	Dodecanoic acid, methyl ester (Lauric acid, methyl ester)	20.13	214	9.46
3	Methyl tetradecanoate	24.76	242	9.42
4	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	27.34	296	0.98
5	2,2-Dimethylocta-3,4-dienal	27.80	152	1.55
6	3,7,11-Trimethyl-2,4-dodecadiene	28.51	208	1.08
7	Hexadecanoic acid, methyl ester (Palmitic acid, methyl ester)	29.00	270	31.04
8	Heptadecanoic acid, methyl ester (Margaric acid methyl ester)	30.91	284	2.70
9	9,12-Octadecadienoic acid (Z,Z)-, methyl ester (Linoleic acid, methyl ester)	32.18	294	12.23
10	9,12,15-Octadecatrienoic acid(Z,Z,Z)-,methyl ester (Linolenic acid, methyl ester)	32.30	292	20.93
11	Methyl stearate	32.79	298	9.31
12	Eicosanoic acid, methyl ester (Methyl arachisate)	36.30	326	0.72

The major components identified in the analyzed sample by GC-MS analysis of *n*-hexane fraction of Dypsis pembana leaves were Palmitic acid methyl ester (Hexadecanoic acid methyl ester) 31.04% followed by Linolenic acid methyl ester (9,12,15-Octadecatrienoic acid(Z,Z,Z)-methyl ester) 20.93% and Linoleic acid methyl ester(9,12-Octadecadienoic acid (Z,Z)-, methyl ester) 12.23% .

Thorough analysis of the chromatogram and careful matching examination of the acquired spectra resulted in identification of 12 phytochemicals and revealed the presence of two fatty acids categories classified as1-Saturated(Palmitic acid methyl ester 31.04%, Lauric acid methyl ester 9.46%, Methyl tetradecanoate 9.42%, Methyl stearate 9.31%, Margaric acid methyl ester 2.70%, Eicosanoic acid methyl ester 0.72%, Capric acid methyl ester 0.57%).
2-Polyunsaturated (Linolenic acid methyl ester 20.93%, Linoleic acid methyl ester 12.23%) detected as their prepared methyl esters.
Other phytochemicals (2,2-Dimethylocta-3,4-dienal 1.55%, 3,7,11-Trimethyl-2,4-dodecadiene 1.08%, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol 0.98%).

Conclusion

In the present study, the different parts (leaf, stem, inflorescence, flower and fruit) of *D. pembana* were subjected to detailed morphological study and detailed anatomical study of the leaf which can be employed for identification, characterization of the plant and can be used for its differentiation from other related species. In addition to the fatty acids composition was studied in the leaves of *D. pembana* using GC-MS. Thus, our research makes a contribution to advanced study of the phytocostituents *D. pembana* This, in turn, may in future initiate the development of more researches concerning phytochemistry and biological studies of *D. pembana*.

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دراسة نباتية وتوصيف الأحماض الدهنية لأوراق نخيل ديبسس بيمبانا المنتمي للعائلة الفوفلية والمنزرع في مصر

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تحتوي العائلة الفوفلية على عديد من المركبات النباتية ولها مجموعة واسعة من الأنشطة الدوائية ، ويستخدم أفراد هذه العائلة في الطب الشعبي لعلاج العديد من الأمراض. تم دراسة الصفات العينانية للسيقان، الأوراق، النورات، الأزهار والثمار بالإضافة إلى الصفات المجهرية لأوراق نخيل ديبسس بيمبانا المنتمي للعائلة الفوفلية المنزرع في مصر للتعرف على النبات بشكل كامل ومسحوق وتم التعرف على الأحماض الدهنية لمستخلص الهكسان والكشف عن وجود الأحماض الدهنية غير المشبعة والمشبعة والمواد الكيميائية النباتية الأخرى.