

## POLLEN MORPHOLOGY OF SOME TEUCRIUM L. (LABIATAE) SPECIES

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### ABSTRACT

In this study, the pollen morphology of pollen grains taken from herbarium specimens of 32 taxa of the genus *Teucrium* L. (*Labiatae*) have been investigated with a light microscope.

The pollen grains show stenopalynous features. Pollen grains radially symmetrical, isopolar, prolate, prolate-spheroidal, subprolate, 3-colpate, operculicolpate, amb intersemiangular. Exine sculpture distinctly verrucate, obscurely verrucate, granulate, obscurely granulate. Exine thicker at poles, sexine much thicker than nexine. Operculum surface covered with small processes.

According to palynological characteristics, the taxa of the genus *Teucrium* examined have been divided into four groups. Some taxonomic problems are attempted to be solved by means of palynological data.

### INTRODUCTION

The genus *Teucrium* L. belongs to the family *Labiatae* (BOISSIER, 1897). 39 taxa of this genus are found in Turkey (EKİM, 1982).

The morphological features of the pollen in some taxa of *Teucrium* have been treated by several authors. ERDTMAN (1952) has provided a short description of *Teucrium*, and has illustrated only two species of *Teucrium*, viz. *T. capitatum* L. var. *valentinum* and *T. pseudochamaepitys* L. NABLI (1970; 1971; 1972 a) has reported the exine and the tryphine ultrastructures of the pollen of some Mediterranean species. NABLI (1972 b) has also reported comparative data on morphology of the pollen grains of *Ajuga chamaepitys* (L.) Schred. and *Teucrium*. FAEGRI and IVERSEN (1975), MOORE and WEEB (1983) have published keys including *Teucrium* pollen.

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The present study has been undertaken in order to provide further information which might prove helpful in elucidating the taxonomy of the genus.

## MATERIAL AND METHODS

All the pollen samples have been taken from herbarium specimens. The pollen slides were prepared following the technique of ERDTMAN (1960). A total of 32 taxa have been investigated. The microscopical work was done with a Leitz-Wetzlar microscope. For detailed studies and measurements, as well as photographing, an apochromate oil immersion objective (x100) was used. Data on size are based upon the measurement of a minimum 10 pollen grains for each taxon. Terminology mainly follows ERDTMAN (1952), some additional terms from FAEGRI and IVERSEN (1975).

## POLLEN DESCRIPTIONS

A general description applicable to all types of *Teucrium* pollen grains investigated is given below.

Pollen grains radially symmetrical, isopolar, prolate, prolate-spheroidal, subprolate, ranging from 22–42  $\mu\text{m}$  in equatorial diameter, 3-colpate, operculicolpate, tectate, amb intersemiangular. Apocolpia 4–11  $\mu\text{m}$  (longest distance between the apices of colpi). Exine thickness 2.51–3.39  $\mu\text{m}$  at mesocolpia, 3.22–4.88  $\mu\text{m}$  at poles. Exine sculpture distinctly verrucate, obscurely verrucate, granulate, obscurely granulate. Sexine much thicker than nexine. Colpi with acute apices. Colpus membranes smooth to granulate. Operculum surface covered with small processes. For details see Table 1.

GENUS : *Teucrium*

Section : *Teucrium*

Exine sculpture distinctly verrucate at mesocolpia, obscurely granulate at poles in the pollen grains of all taxa, except those of *Teucrium multicaule* and *T. parviflorum*.

*Teucrium creticum* (Pl. 1: 1–3)

Pollen grains radially symmetrical, isopolar, subprolate, 36 x 31  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 7  $\mu\text{m}$  in diameter.

Table I: Pollen morphological data The following characters of the pollen grains are compared: (1) Shape. (2) Size: showing range of polar axis (P) and equatorial diameter (E). (3) Apocolpia size as the longest distance between the apices of colpi. (4) Exine thickness at mesocolpia and at poles. (5) Exine sculpture at mesocolpia and at poles. (6): Colpi: size (length x width) and colpus membrane.

Abbreviations. Shape: P = prolate; PSPH = prolate-spheroidal; SP = subprolate. Exine sculpture and colpus membrane; dist. ver. = distinctly verrucate; obs. ver. = obscurely verrucate; gran. = granulate; obs. gran. = obscurely granulate.

	Shape	Pollen grains size (µm)		Apocolpia size (µm)	Exine thickness (µm)		Exine sculpture		Colpi	
		P	E		At mesocolpia	At poles	At mesocolpia	At poles	Size (µm)	membrane
<b>SECTION TEUCRIUM</b>										
<i>Teucrium creticum</i>	SP	36	31	7	?	4	dist. ver.	obs. gran.	25 x 7	gran.
<i>T. sandrasicum</i>	PSPH	36	33	7	3	4	dist. ver.	obs. gran.	26 x 6	gran.
<i>T. brevifolium</i>	SP	39	30	6	3.4	4	dist. ver.	obs. gran.	30 x 4	gran.
<i>T. pestalozzae</i>	PSPH	37	33	6	3	4.2	dist. ver.	obs. gran.	25 x 7	gran.
<i>T. alyssifolium</i>	SP	53	42	11	3.4	3.4	dist. ver.	obs. gran.	40 x 13	gran.
<i>T. multicaule</i>	SP	36	31	6	2.56	3.45	obs. gran.	obs. gran.	29 x 6	gran.
<i>T. orientale</i> var. <i>orientale</i>	P	41	26	8	3	3.5	dist. ver.	obs. gran.	28 x 7	gran.
<i>T. orientale</i> var. <i>puberulens</i>	P	45	32	7	3.4	4.6	dist. ver.	obs. gran.	34 x 6	gran.
<i>T. orientale</i> var. <i>glabrescens</i>	P	43	32	9	3.35	4.85	dist. ver.	obs. gran.	29 x 7	gran.
<i>T. pruinosum</i>	SP	32	28	5	3.22	4.03	dist. ver.	obs. gran.	24 x 6	gran.
<i>T. parviflorum</i>	PSPH	29	27	6	3.18	4.08	obs. gran.	obs. gran.	21 x 6	gran.
<b>SECTION SCORDIUM</b>										
<i>T. scordium</i> subsp. <i>scordium</i>	SP	31	26	4	2.6	3.4	obs. gran.	obs. gran.	23 x 5	gran.
<i>T. scordium</i> subsp. <i>scordioides</i>	PSPH	30	28	4	2.7	3.22	obs. gran.	obs. gran.	23 x 5	gran.
<b>SECTION CHAMAEDRYIS</b>										
<i>T. chamaedrys</i> subsp. <i>chamaedrys</i>	P	39	26	5	2.54	3.56	obs. ver.	gran.	30 x 7	smooth
<i>T. chamaedrys</i> subsp. <i>lydium</i>	P	46	28	5	2.6	4.2	obs. ver.	gran.	38 x 6	smooth
<i>T. chamaedrys</i> subsp. <i>trapezunticum</i>	P	41	27	6	3	4.36	obs. ver.	gran.	ill-defined	smooth
<i>T. chamaedrys</i> subsp. <i>tauricolium</i>	P	43	26	6	2.5	3.84	obs. ver.	gran.	34 x 6	smooth
<i>T. chamaedrys</i> subsp. <i>sypsiense</i>	P	41	26	4	2.5	3.6	obs. ver.	gran.	36 x 6	smooth
<i>T. chamaedrys</i> subsp. <i>sinuatum</i>	P	36	22	5	2.6	4.06	obs. ver.	gran.	29 x 5	smooth
<i>T. divaricatum</i> subsp. <i>divaricatum</i>	SP	38	30	6	3.32	4.4	obs. ver.	gran.	29 x 4	gran.
<i>T. divaricatum</i> subsp. <i>villosum</i>	SP	36	28	5	3	3.63	obs. ver.	gran.	ill-defined	gran.
<i>T. flavum</i> subsp. <i>hellenicum</i>	SP	39	31	5	3	4.15	obs. ver.	gran.	32 x 5	gran.
<b>SECTION POLIUM</b>										
<i>T. montanum</i>	SP	32	28	5	2.66	3.53	obs. ver.	gran.	26 x 6	smooth
<i>T. polium</i>	P	37	27	5	3	4.9	obs. ver.	gran.	29 x 6	smooth
<b>SECTION ISOTRIODON</b>										
<i>T. montbretii</i> subsp. <i>montbretii</i>	PSPH	31	28	4	3	3.8	dist. ver.	obs. gran.	25 x 4	smooth
<i>T. montbretii</i> subsp. <i>pamphylicum</i>	P	39	27	5	3	3.9	dist. ver.	obs. gran.	30 x 5	smooth
<i>T. odontites</i>	P	37	24	4	2.76	4.02	dist. ver.	obs. gran.	34 x 4	smooth
<i>T. cavernarum</i>	P	36	25	5	3	4.22	dist. ver.	obs. gran.	28 x 5	smooth
<i>T. antitauricum</i>	P	40	24	5	2.76	4	dist. ver.	obs. gran.	29 x 4	smooth
<i>T. paederotoides</i>	P	35	23	6	2.8	4.08	dist. ver.	obs. gran.	29 x 5	smooth
<b>SECTION STACHYBOTRYIS</b>										
<i>T. lamiiifolium</i> subsp. <i>lamiiifolium</i>	SP	36	28	6	2.7	3.72	obs. ver.	obs. gran.	28 x 5	smooth
<b>SECTION SCORODONIA</b>										
<i>T. kotschyannum</i>	SP	35	28	6	2.7	4	obs. ver.	obs. gran.	26 x 4	smooth

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4  $\mu\text{m}$  thick at poles.

Colpi 25  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. sandrasicum* (Pl. 1: 4-5)

Pollen grains radially symmetrical, isopolar, prolate-spheroidal, 36 x 33  $\mu\text{m}$ , 3-colpate, operaculicolpate, tectate. Amb intersemian-gular. Apocolpia 7  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4  $\mu\text{m}$  thick at poles.

Colpi 26  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. brevifolium*

Pollen grains radially symmetrical, isopolar, subprolate, 39 x 30  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 3.4  $\mu\text{m}$  thick at mesocolpia, 4  $\mu\text{m}$  thick at poles.

Colpi 30  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. pestalozzae*

Pollen grains radially symmetrical, isopolar, prolate-spheroidal, 37 x 33  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4.2  $\mu\text{m}$  thick at poles.

Colpi 25  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. alyssifolium*

Pollen grains radially symmetrical, isopolar, subprolate 53 x 42  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 11  $\mu\text{m}$  in diameter.

Exine 3.4  $\mu\text{m}$  thick at mesocolpia, 4.2  $\mu\text{m}$  thick at poles.

Colpi 40  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. multicaule* (Pl. 1: 6-9)

Pollen grains radially symmetrical, isopolar, subprolate, 36 x 31  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 2.56  $\mu\text{m}$  thick at mesocolpia, 3.45  $\mu\text{m}$  thick at poles. Exine sculpture obscurely granulate at mesocolpia.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. orientale* var. *orientale*

Pollen grains radially symmetrical, isopolar, prolate, 41 x 26  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 8  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 3.5  $\mu\text{m}$  thick at poles.

Colpi 28  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. orientale* var. *puberulens*

Pollen grains radially symmetrical, isopolar, prolate, 45 x 32  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 7  $\mu$  in diameter.

Exine 3.4  $\mu\text{m}$  thick at mesocolpia, 4.6  $\mu\text{m}$  thick at poles.

Colpi 34  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. orientale* var. *glabrescens*

Pollen grains radially symmetrical, isopolar, prolate, 43 x 32  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 9  $\mu\text{m}$  in diameter.

Exine 3.35  $\mu\text{m}$  thick at mesocolpia, 4.85  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. pruinorum*

Pollen grains radially symmetrical, isopolar, subprolate, 32 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3.22  $\mu\text{m}$  thick at mesocolpia, 4.03  $\mu\text{m}$  thick at poles.

Colpi 24  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. parviflorum*

Pollen grains radially symmetrical, isopolar, prolate-spheroidal, 29 x 27  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 3.18  $\mu\text{m}$  thick at mesocolpia, 4.08  $\mu\text{m}$  thick at poles. The pollen grains are most closely resemble those of *T. multicaule* in exine sculpturing.

Colpi 21  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

Section: *Scordium*

Exine sculpture obscurely granulate both at mesocolpia and at poles.

*T. scordium* subsp. *scordium* (Pl. 1: 10–14)

Pollen grains radially symmetrical, isopolar, subprolate, 31 x 26  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 4  $\mu\text{m}$  in diameter.

Exine 2.6  $\mu\text{m}$  thick at mesocolpia, 3.4  $\mu\text{m}$  thick at poles.

Colpi 23  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. scordium* subsp. *scordioides*

Pollen grains radially symmetrical, isopolar, prolate-spheroidal, 30 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 4  $\mu\text{m}$  in diameter.

Exine 2.7  $\mu\text{m}$  thick at mesocolpia, 3.22  $\mu\text{m}$  thick at poles.

Colpi 23  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

Section: *Chamaedrys*

Exine sculpture obscurely verrucate at mesocolpia, granulate at poles.

*T. chamaedrys* subsp. *chamaedrys* (Pl. 1: 15–19)

Pollen grains radially symmetrical, isopolar, prolate, 39 x 22  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 2.54  $\mu\text{m}$  thick at mesocolpia, 3.56  $\mu\text{m}$  thick at poles.

Colpi 30  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. chamaedrys* subsp. *lydium*

Pollen grains radially symmetrical, isopolar, prolate, 46 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 2.6  $\mu\text{m}$  thick at mesocolpia, 4.2  $\mu\text{m}$  thick at poles.

Colpi 38  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. chamaedrys* subsp. *trapezunticum*

Pollen grains radially symmetrical, isopolar, prolate, 41 x 27  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemianangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4.36  $\mu\text{m}$  thick at poles.

Colpi with acute apices. Colpi membranes smooth.

*T. chamaedrys* subsp. *tauricum*

Pollen grains radially symmetrical, isopolar, prolate, 43 x 26  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 2.5  $\mu\text{m}$  thick at mesocolpia, 3.84  $\mu\text{m}$  thick at poles.

Colpi 34  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. chamaedrys* subsp. *sypirensis*

Pollen grains radially symmetrical, isopolar, prolate, 41 x 26  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 4  $\mu\text{m}$  in diameter.

Exine 2.5  $\mu\text{m}$  thick at mesocolpia, 3.6  $\mu\text{m}$  thick at poles.

Colpi 36  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. chamaedrys* subsp. *sinuatum*

Pollen grains radially symmetrical, isopolar, prolate, 36 x 22  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 2.6  $\mu\text{m}$  thick at mesocolpia, 4.06  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. divaricatum* sunsp. *divaricatum*

Pollen grains radially symmetrical, isopolar, subprolate, 38 x 30  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 3.32  $\mu\text{m}$  thick at mesocolpia, 4.4  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

*T. divaricatum* subsp. *villosum*

Pollen grains radially symmetrical, isopolar, subprolate, 36 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 3.63  $\mu\text{m}$  thick at poles.

Colpi with acute apices. Colpi membranes granulate.

*T. flavum* subsp. *hellenicum*

Pollen grains radially symmetrical, isopolar, subprolate, 39 x 31  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4.15  $\mu\text{m}$  thick at poles.

Colpi 32  $\mu\text{m}$  long, with acute apices. Colpi membranes granulate.

Section: *Polium*

Exine sculpture is most closely resemble that of the pollen grains of taxa of Section *Chamaedrys*.

*T. montanum* (Pl. 2: 1-4)

Pollen grains radially symmetrical, isopolar, subprolate, 32 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 2.66  $\mu\text{m}$  thick at mesocolpia, 3.53  $\mu\text{m}$  thick at poles.

Colpi 26  $\mu\text{m}$  long, with acute apices. Colpi membranes smoth.

*T. polium*

Pollen grains radially symmetrical, isopolar, prolate, 37 x 27  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4.9  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes smoth.

Section: *Isotriodon*

Exine sculpture is similar to that of Section *Teucrium*.

*T. montbretii* subsp. *montbretii* (Pl. 2: 5-9)

Pollen grains radially symmetrical, isopolar, prolate-spheroidal, 31 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb. intersemiangular. Apocolpia 4  $\mu\text{m}$  in diameter.



Exine 3  $\mu\text{m}$  thick at mesocolpia, 3.8  $\mu\text{m}$  thick at poles.

Colpi 25  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. montbretii* subsp. *pamphylicum*

Pollen grains radially symmetrical, isopolar, prolate, 39 x 27  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 3.8  $\mu\text{m}$  thick at poles.

Colpi 30  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. odontites*

Pollen grains radially symmetrical, isopolar, prolate, 37 x 24  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 4  $\mu\text{m}$  in diameter.

Exine 2.76  $\mu\text{m}$  thick at mesocolpia, 4.02  $\mu\text{m}$  thick at poles.

Colpi 34  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. cavernarum*

Pollen grains radially symmetrical, isopolar, prolate, 36 x 24  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 3  $\mu\text{m}$  thick at mesocolpia, 4.22  $\mu\text{m}$  thick at poles.

Colpi 28  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. antitauricum*

Pollen grains radially symmetrical, isopolar, prolate, 40 x 25  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 5  $\mu\text{m}$  in diameter.

Exine 2.76  $\mu\text{m}$  thick at mesocolpia, 4  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

*T. paederotoides*

Pollen grains radially symmetrical, isopolar, prolate, 35 x 23  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 2.8  $\mu\text{m}$  thick at mesocolpia, 4.08  $\mu\text{m}$  thick at poles.

Colpi 29  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

Section: *Stachyobotrys*

Exine sculpture obscurely verrucate at mesocolpia, obscurely granulate at poles.

*T. lamiifolium* subsp. *lamiifolium* (Pl. 2: 10–13)

Pollen grains radially symmetrical, isopolar, subprolate, 36 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 2.7  $\mu\text{m}$  thick at mesocolpia, 3.72  $\mu\text{m}$  thick at poles.

Colpi 28  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

Section: *Scorodonia*

Exine sculpture is the same as the pollen grains of *T. lamiifolium* subsp. *lamiifolium* belonging to Section *Stachyobotrys*

*T. kotschyanum* (Pl. 2: 14–17)

Pollen grains radially symmetrical, isopolar, subprolate, 35 x 28  $\mu\text{m}$ , 3-colpate, operculicolpate, tectate. Amb intersemiangular. Apocolpia 6  $\mu\text{m}$  in diameter.

Exine 2.7  $\mu\text{m}$  thick at mesocolpia, 4  $\mu\text{m}$  thick at poles.

Colpi 26  $\mu\text{m}$  long, with acute apices. Colpi membranes smooth.

## RESULTS AND DISCUSSION

In general the pollen grains are radially symmetrical, isopolar, 3-colpate, operculicolpate and tectate. The shape of the pollen grains varies from prolate to subprolate rarely prolate-spheroidal as occasionally encountered in *Teucrium sandrasicum*, *T. pestalozzae*, *T. parviflorum*, *T. scordium* subsp. *scordiodes*, *T. montbretii* subsp. *montbretii*. The smallest pollen grains are found in *T. parviflorum*, the largest in *T. alyssifolium*. The amb shapes are invariably intersemiangular. The apocolpium diameter in the species studied ranges from 4 to 11  $\mu\text{m}$ . *T. scordium* subsp. *scordium*, *T. scordium* subsp. *scordioides*, *T. chamaedrys* subsp. *sypshirense*, *T. montbretii* subsp. *montbretii* and *T. odontites* have the smallest and *T. alyssifolium* has the largest diameter. Exine is much thicker at polar areas, decreasing in thickness towards the margins of apertures. The exine sculpture of the grains of some sections varies slightly at mesocolpia and at poles. 4 pollen types may be distinguished mainly based on exine sculpture:

1. *Teucrium* type: Exine sculpture distinctly verrucate at mesocolpia, obscurely granulate at poles.

2. *Scordium* type: Exine sculpture obscurely granulate both at mesocolpia and at poles.

3. *Chamaedrys* type: Exine sculpture obscurely verrucate at mesocolpia, granulate at poles.

4. *Stachyobotrys* type: Exine sculpture obscurely verrucate at mesocolpia, obscurely granulate at poles.

The exine is clearly divided into sexine and nexine. The sexine is much thicker than the nexine. The colpi are, as a rule, tapering, frequently with acute apices. Colpi membranes are smooth to granulate. Operculum surface is covered with small processes.

Our observations with light microscope have revealed that the taxa of the genus *Teucrium* investigated are rather homogenous with respect to their pollen morphology. However, the sections of *Teucrium* can be palynologically distinguished by the exine sculptures at mesocolpia and poles. According to this character, seven sections of *Teucrium* studied can be roughly divided into four groups:

#### GROUP 1.

Species belonging to *Teucrium* (except *T. multicaule* and *T. parviflorum*) and *Isotriodon* sections, having the *Teucrium* type pollen grains, belong here (Pl. 1: Figs. 1-5, Pl. 2: Figs. 5-9).

Although morphological features are widely different, the pollen grains of these two sections are similar in exine sculpturing at mesocolpia and poles. They can be combined in a single group with regard to palynological features.

#### GROUP 2.

*Teucrium multicaule*, *T. parviflorum* and species belonging to Section *Scordium*, having the *Scordium* type pollen grains, belong to this group (Pl. 1: Figs. 6-14).

The grains of *T. multicaule* and *T. parviflorum*, in which floral and vegetative characters seem closely related to Section *Teucrium* so that they are placed in it by several authors (BOISSIER, 1897;

YUZEPCHUK, 1954; EKİM, 1982), are more similar in exine sculpturing at mesocolpia to those of taxa belonging to Section *Scordium* than to Section *Teucrium*.

#### GROUP 3.

Species belonging to *Chamaedrys* and *Polium* sections, having the *Chamaedrys* type pollen grains, belong here (Pl. 1: Figs. 15–19, Pl. 2: Figs. 1–4).

As a result of comparative study of inflorescences and flowers KASTNER (1978) proposes a new classification of the genus and suggests that these two sections should be placed in a single group. The similarity of the pollen morphology of Section *Chamaedrys* to that of Section *Polium* supports the suggestion of KASTNER.

#### GROUP 4.

*Teucrium lamiifolium* subsp. *lamiifolium* belonging to Section *Stachyobotrys* and *T. kotschyanum* belonging to Section *Scorodonia*, having the *Stachyobotrys* type pollen grains, belong here (Pl. 2: Figs. 10–17).

The conclusion is that this palynological study has revealed four pollen types, but a closer study carried out by SEM and TEM may reveal new data for a better grouping.

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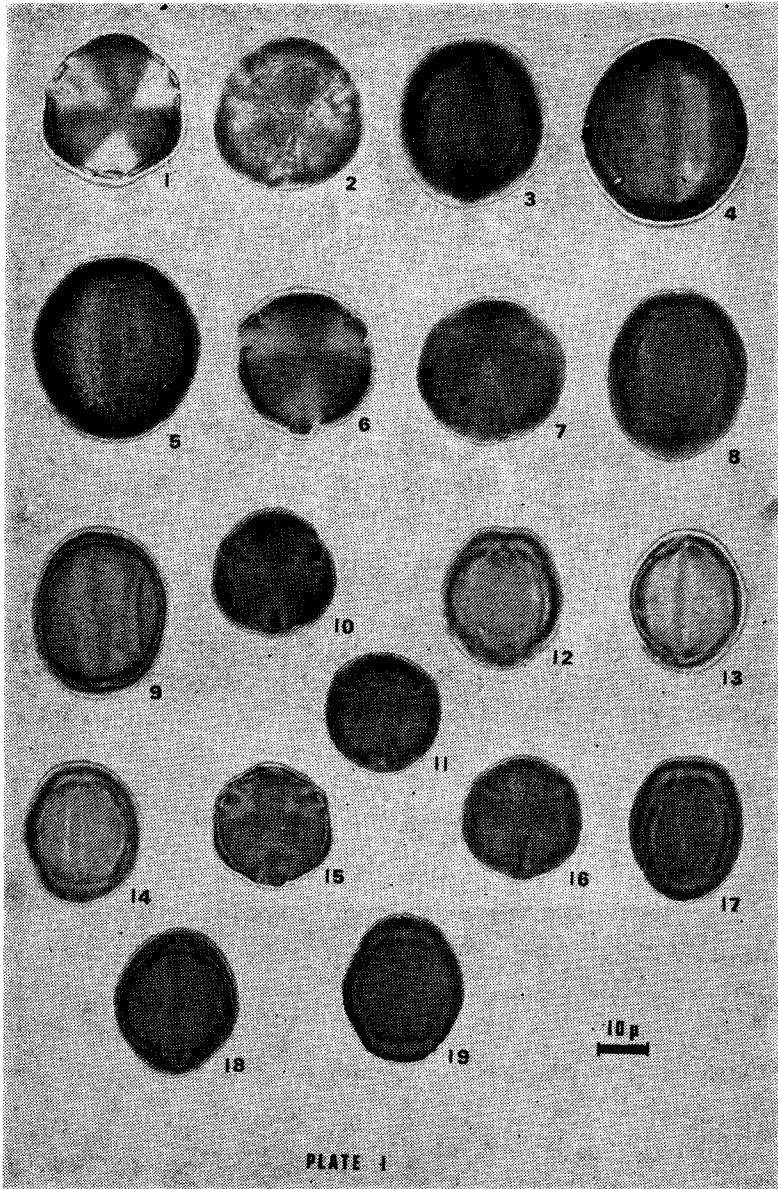
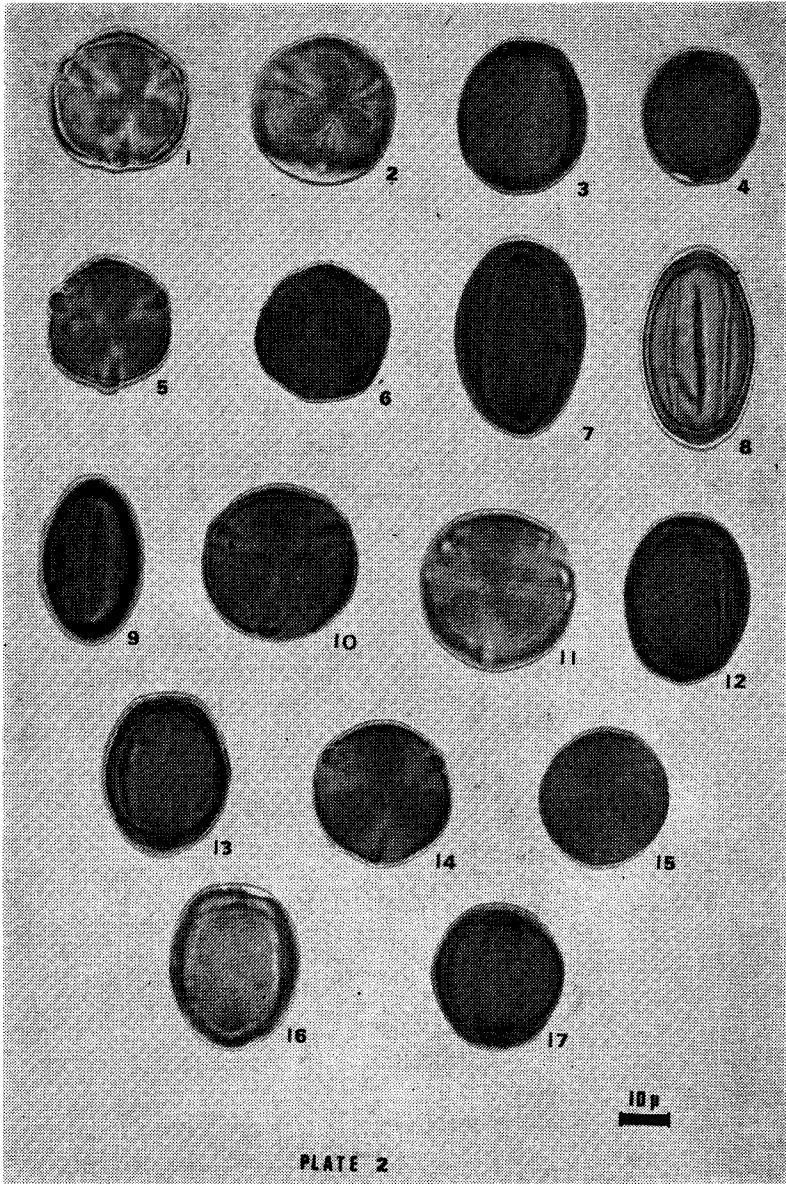


PLATE 1



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