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INVESTIGATION ON POLLEN MORPHOLOGY OF TWO *GAGEA* SALISB. TAXA FROM TURKEY

OKAN SEZER, ALI CAN YILDIZ, ONUR KOYUNCU, KORAY YAYLACI, ISMUHAN POTOGLU ERKARA

ABSTRACT. In this study, detailed morphological investigation on the pollen of two Turkish *Gagea* species (*G. glacialis* and *G. fibrosa*) was carried out under light microscope and SEM. Pollen grain microphotographs of examined taxa have been taken from preparates which were made by Wodehouse and Erdtman techniques in LM. According to this analysis, Pollen ornemantetion of investigated taxa are identified as reticulate for *Gagea glacialis*, microreticulate for *G. fibrosa*. For *G. glacialis* mono sulcate, subprolate P/E= 0.76 (W), 0.8 (E), Exine 1.3 µm (W), 1.366 µm (E). For *G. fibrosa*, pollen grains measured as mono sulcate, subprolate P/E= 0.78 (W), 0.73 (E), Exine 1.316 µm (W), 1.25 µm (E).

1. INTRODUCTION

The *Gagea* Salisb. which contains about 320 species is one of the genera from Liliaceae. *Gagea* is bigger family and it's taxa distributes many areas in Europe, Asia and North Africa [1, 11]. Also many of these *Gagea* taxa have natural distribution in Turkey. With recent taxonomic studies, the number of *Gagea* taxa in the flora of Turkey were reached to 31. Four of these are endemic to Turkey and they do not identified any other country yet [5, 15].

With this study, morphological characteristics of the pollen grains of two *Gagea* species (*Gagea glacialis* K. Koch and *G. fibrosa* (Desf.) Schult. & Schult.f.) were identified. Examinations and measurements have been performed on these and morphometric results given. Obtained data from this study are described here for the first time. We believe that comparisons and evaluations of obtained data from like these studies will make important contributions to plant taxonomy in future.

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2. Materials And Methods

Polen samples were obtained from fresh specimens that was collected from Muğla province (Table 1). All plant specimens was stored in OUFE. At the palynological studies, pollens of 20 different herb's flowers were used for each specimen which were taken from different areas. The pollen morphology of taxa was investigated by using light microscopy. Faegri and Iversen's terminology for the names of the exine layers was used [4]. In the light microscope investigation, the pollen grains acquired from the samples were obtained by using the preparation method described by Wodehouse (1935) and Erdtman (1969). Identifications and counts at 10x and 40x plan objectives were used; for the purpose of identification, a 100x plan oil-immersion objective was used. Pollen identifications and counts were obtained by Nikon trinocular microscope. The spacing between each ocular micrometer was 0.98 µm. According to Wodehouse's (1935) and Erdtman's (1969) methods, the exine and intine thickness of the taxa were measured. The unacetolyzed pollen grains were directly placed on stubs, sputter-coated with gold plate, and examined with a Jeol 5600 LV scanning electron microscope. Terminologies for pollen morphology were used [2, 4, 9, 17].

TABLE 1. Localities of studied *Gagea* taxa.

Taxa	**Collector**	**Locality**
Gagea glacialis K. Koch	A.C.Yıldız	Muğla, Köyceğiz, Sandras Mountain, Kartal lake road, N: 37°08'05556 E: 28°83'91667'', 28.04.2017.
Gagea fibrosa (Desf.) Schult. &Schult.f.	A.C.Yıldız	Muğla, Kötekli, N:37°16'6282''- E: 28°38'8018'', 26.03.2017

3. Results And Discussion

For *Gagea glacialis*, pollen ornamentation are identified as reticulate. Pollen grains of *G. glacialis* are identified as monosulcate and their P/E ratio measured 0.76 (W), 0.8 (E). All pollen grains are subprolate shaped. Exine thickness are 1.3 µm (W), 1.366 µm (E) (Figure 1, Table 2). In contrast to *G. glacialis*, exine layer ornamentated as microreticulate in *G. fibrosa*. Pollen grains observed mono sulcate as in *G. glacialis*. P/E values are nearly same with *G. glacialis*. P/E= 0.78 (W), 0.73 (E). Exine thickness of *G. fibrosa are* 1.316 µm (W), 1.25 µm (E) (Figure 2, Table 2).

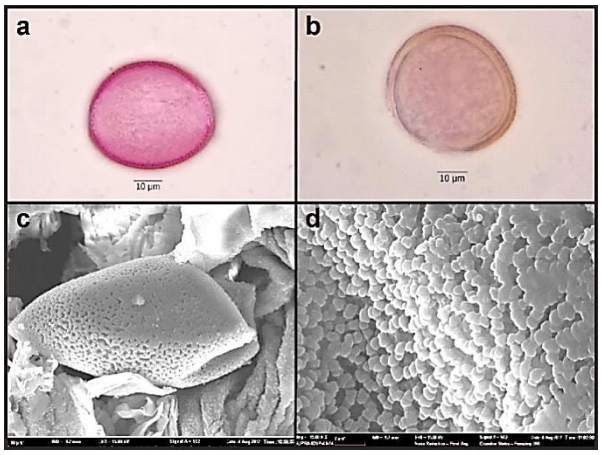

FIGURE 1. Pollen grains of *Gagea glacialis* (**a:** non-acetolised pollen grain; **b:** acetolised pollen grain, **c:** Equatorial view of pollen grain by SEM, **g:** Exine ornamentation of pollen grain by SEM).

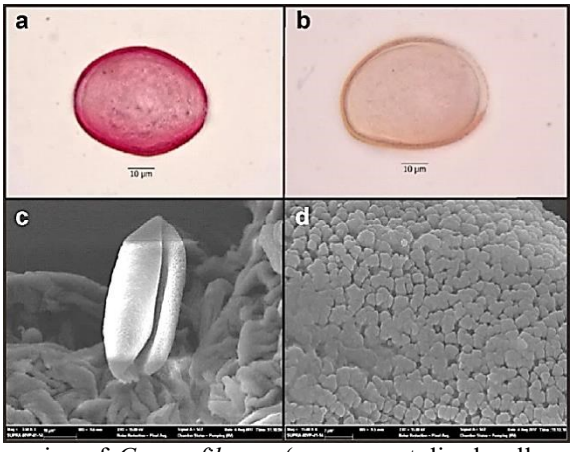

FIGURE 2. Pollen grains of *Gagea fibrosa* (**a:** non-acetolised pollen grain; **b:** acetolised pollen grain, **c:** Equatorial view of pollen grain by SEM, **g:** Exine ornamentation of pollen grain by SEM).

Flora of Turkey is quite rich due to it's high endemic plant taxa number. Today about 3000 of Turkey flora members are endemic to Turkey [3]. *Gagea* is important plant genus with 31 taxa in Turkey. Unfortunately it's endemism ratio is low compared with some other genera. Only 4 *Gagea* taxa endemic to Turkey.

TABLE 2. Pollen morphometrical parameters of *Gagea* taxa (µm); (**P:** Polar axis; **E:** Equatorial axis; **M:** Mean; **S:** Standard deviations).

	P			E			P/E	cg			ct			Ex			I		
	M	S	Var.	M	S	Var.		M	S	Var.	M	S	Var.	M	S	Var.	M	S	Var.
Gagea glacialis (W)	34, 8	2, 84	40-30	45, 73	2, 86	50-40	0, 76	40, 28	4, 71	51-31	9, 785	4, 52	22_5	1, 3	0, 33	2_1	0, 65	0, 23	0,5-1
Gagea glacialis (E)	36, 1	2, 56	40-28	44, 83	2, 73	49-40	0, 8	37, 81	1, 4	40-36	8, 1	1, 48	10_5	1, 366	0, 29	2_1			
Gagea fibrosa (W)	40, 6	6, 74	55-32	51, 46	7, 17	70-42	0, 78	42, 76	5, 59	58-32	13, 47	3, 24	20_5	1, 316	0, 33	2_1	0, 783	0, 25	0,5-1
Gagea fibrosa (E)	37, 66	3, 37	45-31	51, 23	3, 01	59-44	0, 73	43, 58	2, 35	48-38	12, 25	4, 39	20_5	1, 25	0, 28	2_1			

Until today, many scientist studied on *Gagea* taxa in multidisciplinary and so it's taxanomy draw attention [1, 8, 10, 14].

According to the Takhtajan 1987, smooth sulcus, reticulate-microreticulate and perfore exine, complete or united muri are main palynomorphological characters in *Gagea* species.

Taxonomy of *Gagea* is harder than many other Liliaceae taxa owing to some problems. For example, vegatative and generative characters of *Gagea* taxa have high variation in different ecological conditions and ontogenic levels and so discrimination of *Gagea* taxa is so hard [18]. Besides, subgeneric classification under genus category already contradictive.

Recent studies caused to changes in subgeneric classification of *Gagea* taxa. So it is divided into different sections and series. Also these studies indicated that, in classification of Liliaceae "especially *Gagea* taxa" morphological features of pollen grains are so valueble [6, 7, 8, 12, 13, 16].

According to the gained data from palynological investigations, *Gagea* taxa show heterogeneous distribution pattern in groups and subgroups. This findings support some last studies. Palynological characters which was given in this study will bring the light into plant systematics due to their systematic importance and usability in subgeneric classification.

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