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International Journal of Current Research
Vol. 9, Issue, 08, pp.56350-56353, August, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

PALYNOLOGICAL STUDY OF THE GENUS *MINUARTIA* L. (CARYOPHYLLACEAE) IN IRAQ

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ARTICLE INFO

Article History:
Received 25th May, 2017
Received in revised form
14th June, 2017
Accepted 20th July, 2017
Published online 31st August, 2017

Key words:

Minuartia, Caryophyllaceae,
Pollen grains, Ornamentation.

ABSTRACT

Pollen morphology of eight species belongs to *Minuartia* L. from Iraq were studied by light and scanning microscope, *M.aucheriana* (Boiss.) Bornm., *M.hamata* (Hausskn.) Mattf, *M.hybrida* (Vill.) Schischk., *M.intermedia* (Boiss.) Hand-Mazz., *M.meyeri* (Boiss.) Bornm., *M.montana* L., *M.picta* (Sibth.&Sm.) Bornmand *M.recurva* (All.) Schinz & Thell. Pollen typepolyporate were recognized, pollen grains were spheroidal in all species. Exine was more thickness than intine. Pollen grain size varies from small in *M.intermedi*, small to middle in *M.picta, M.hamata, M.hybrida, M.meyeri, M.montana* and *M.aucheriana* and middle in rest species. There are two types of tectum verrucate and microechinate- perforate Palynological data has been useful at genus and species levels.

Citation: Sadeq S. Kareem Al-Taie and Sahar A.A. Malik Al-Saadi, 2017. "Palynological study of the genus *Minuartia* L. (Caryophyllaceae) in Iraq", *International Journal of Current Research*, 9, (08), 56350-56353.

INTRODUCTION

The genus *Minuartia* L. belongs to the family Caryophyllaceae (the subfamily Minuartioideae (DC.) Beilschm., tribe Alsineae DC., according to Takhtajan (1997) *Minuartia*is a comprises an estimated 175 species distributed in temperate and arctic areas of northern Africa, Asia, Europe, North and South America Rabeler *et al.*, 2005). Only nine species were distribution in north and west region of Iraq. *Minuartia* includes seven sections and 74 taxa in the flora of Turkey (McNeill, 1967). The genus is represented by57 species in Europe (Tutin *et al*., 1964), while in Palestine with 7 species (Zohary, 1972). Rechinger (1988) mentioned in Flora Iranica 21 species belonging to six sections in Iran. The previous studies that carried out on morphology of Caryophyllaceae had been done by (Wodehouse, 1935). Erdtman (1952) studied palynology of 50 genus belongs to 100 species of Caryophyllaceae, and reported that all species was stenopalynous. Yildiz (2001) described and analyzed the pollen grains of two species from *Minuartia* (*M. juniperina* and *M. verna*) in Turkey. Pollen grains of *M. hybrid* and *M. biflora* studied by Perveen and Qaiser (2006), which reported that the pollen grain diameter (29 and 28.25) um and Exine (3 and 5.5) um respectively. *M.sabalanica and M. umbellulifera* in Iran studied by Mostafavi *et al*. (2011), reported scabrate-punctate ornamentation, while Gucel (2013) studied pollen characters in the *M.nifensis* from Turkey. The aim of this study is to do pollen grains characters study for nine species of the *Minuartia* in Iraq and describes the variation within taxa of *Minuartia* and assesses the value of interrelationships between species.

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MATERIALS AND METHODS

Flowers of nine species of *Minuartia* were mostly collected in the field in Iraq (Table 1). Some were obtained from the herbarium specimens. All collections were fixed in F.A.A.(5 ml Formaline: 5 ml acetic acid: 90 ml of 70% ethyl alcohol), using pollen grains acetolyzed according (Erdtman, 1952). The preparation of transmission electron microscopy, dehydrated in graded ethanol series, transferred to 100% acetone, then placed on specimen stubs, and sputter coated with gold. The examination and photomicrographs were made by a scanning electron microscope.

RESULTS AND DISCUSSION

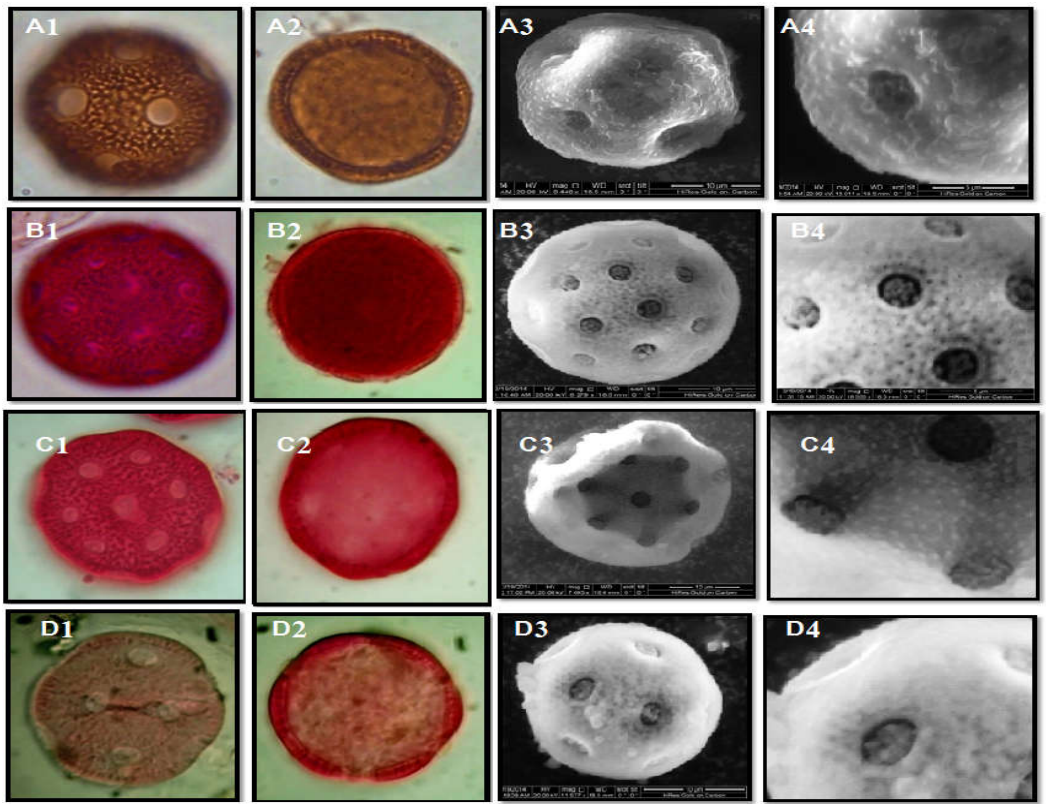
Pollen grains of *Minuartia* are characterized by polyporate agree with (Erdtman, 1952; Perveen; Qaiser, 2006; Gucel, 2013). Most of species was polyhedral, but it was subspheroidal in *M. hybrid* subsp. *turcica* and *M. picta,* spheroidal in *M.meyeri, M. intermedia* and *M. hybrid* subsp. *hybrid*. The size of pollen grains divided the *Minuartia* into three groups, pollen grains small size (10-25) um in *M. intermedia,* second group medium pollen grains including

Table 1. Details about samples of pollen grains

Taxa	Collection site	Collectiondate	No. of samples
M.hamata	Jabel Singar, 4km befor Hajamrn	1/5/1979	0034893
	N.E. of Amadya	15/5/2014	119
		14/5/2014	110
M.hybrida subsp. *hybrida*	12 km. from Sinjar to Karsi	25/4/1978	37731
	Sakryskran mountain	15/5/2014	162
	Deleja	12/5/2014	50
M.hybrida subsp. *turcica*	Great Zab near Kau Gossik	28/3/1948	10.534
	Sakryskran mountain	11/5/2014	180
	Qarahangel	13/3/2014	179
M.intermedia	Jabal singar. 4km. N.E. of Karsi	17/5/1979	0034862
	Hajamran	15/5/2014	201
M.juniperina	N.E. of Qandil	26/8/1957	24395
M.meyeri	Avroman (Horaman) Mountains around Tawila, in Sulaimaniya Liwa Pira magrun	16/6/1957	679600
	Mountain	8/5/2014	250
M.montana	10 km. W. of Tawela	15/6/1957	22132
	(on road between Halabja &Tawela)		
	Pira magrun Mountain	8/5/2014	204
M.picta	10-15km. E of Arbil (to Darband)	20/4/1958	25288
	Qarhangel	12/3/2014	280
M.recurva	Ser Kurawa NE. Slopes of Arl Gird Dagh	11/8/1947	9743

Table 2. Pollen grain morphology of *Minuartia* species (values in µm)

Taxa	Pollen shape	Number of pores	Pollen dimension (P/E)	Pore diameter		Size of pollen	Exine thickness	Intine thickness
				Length	width			
M.hamata	polyhedral	6-12	(22.5-30) 24.72	(5-7.5) 7.10	(5-7.5) 7.03	S-M	(1.87-3.75) 2.87	(0.37-2.5) 1.03
M.hybrida subsp.*hybrida*	Spherical	24-34	(20-45) 31.87	(3.12-7.5) 5.06	(3.75-7.5) 4.89	S-M	(1.87-2.5) 2.12	(0.62-2.5) 2.21
M.hybrida subsp.*turcica*	Subspherical	12-18	(27.5-37.5) 35.15	(4-5) 4.12	(4.2-5) 4.75	M	(1.1-2) 1.87	(0.12-1) 0.62
M.intermedia	Spherical	6-14	(17.5-24.25) 21.28	(3.75-5) 4.84	(3.75-5) 4.84	S	(1.87-2.5) 2.08	(0.62-1.25) 0.72
M.junperiana	polyhedral	8	(17.5-30) 23.75	(4.5-6) 5.11)	(4.2-5.5) 5.01	S-M	(1.25-1.87) 1.56	(0.26-1.25) 0.93
M.meyeri	Spherical	8-24	(25-35) 29.37	(5-11.25) 7.65	(3.75-11.25) 7.34	S-M	(1.87-3.75) 2.70	(0.62-1.25) 1.04
M.montana	polyhydral	6-8	(20-26.25) 23.37	(3.75-5) 4.58	(3.75-5) 4.58	S-M	(1-2) 1.25	(0.62-1.25) 0.78
M.recurva	subspherical	6-16	1.56-26.95) 23.10	(3.08-3.85) 3.56	(3.08-3.85) 3.43	S-M	(1.61-2.31) 2.10	(0.38-0.69) 0.47
M.picta	polyhedral	6-10	(32.5-37.5) 34.11	(5-6.25) 5.67	(5-6.25) 5.31	M	(1.87-2.5) 2.08	(0.62-1.25) 0.71



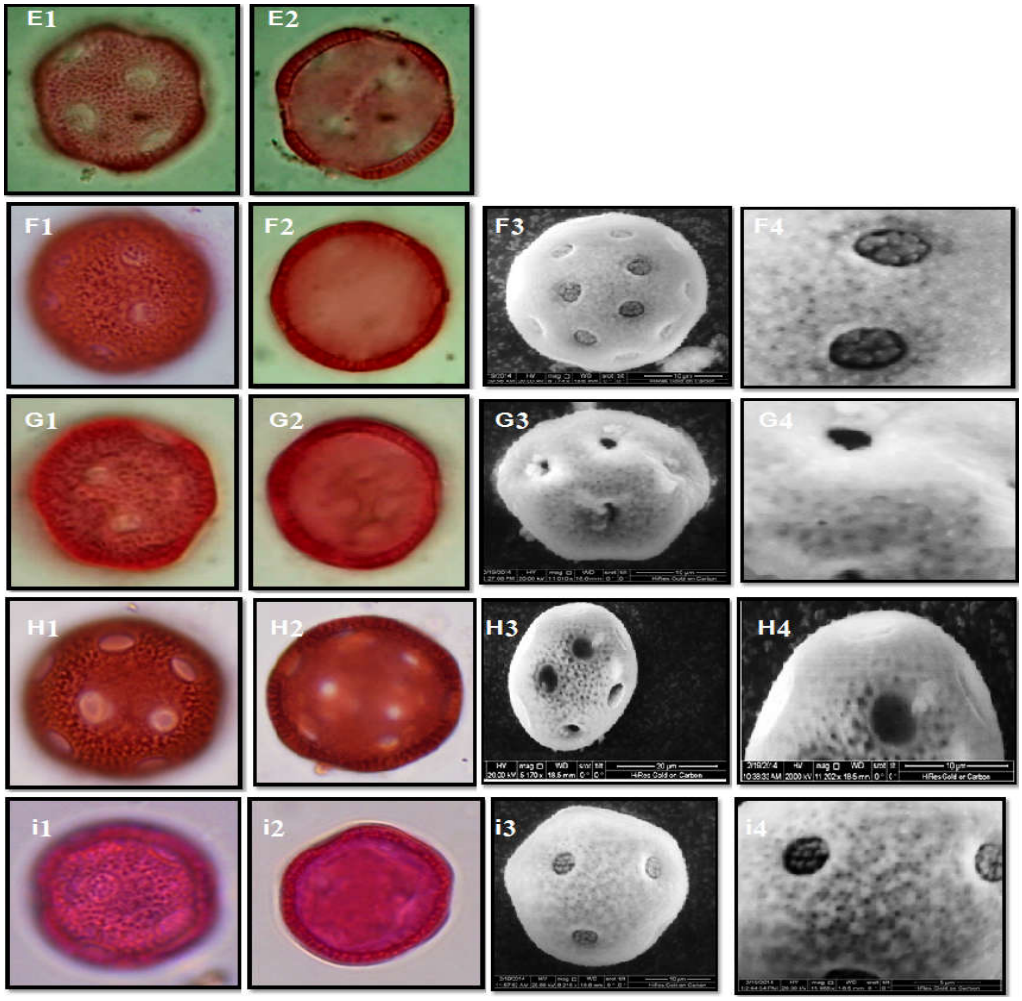


Figure 1. LM and SEM photos of pollen grains of *Minuartia* species

A: *M.hamata* ; B:*M.hybrida* subsp. *hybrida* ; C:M.*hybrida* subsp. *turcia* D: *M.intermedi*; E: *M.juniperina*; F:*M.meyeri*; G:*M.montana* ; H:*M.picta* i: *M.recurva* (1: Pollen grain Shape; 2: External wall of pollen grain; 3: Pollen under SEM; 4: Ornemantation).

M.recurva and *M. hybrid* subsp. *turcica*, and third group including the most of species was small- medium. Small pollen grains not agree with Skvarla, 1975; Nowicke and Skvarla, 1977; Ghanzanfer, 1984; Arkan and Incoeglu, 1992; Yildiz, 2001). The species different in number of pores, it is reduced in *M. recurve* (6-8) and higher in *M. hybrid* subsp. *hybrida* (24-34) (Figure 1, Table 2), thus supporting the separate of species taxonomically. Pollen grain wall showed that exine more thickness entine, it was higher in *M. hamata* (2.87 um) and the thinner in *M. montana* (1.25 um). The tectum is microechinate- perforate in most of species except *M. hamata* was verrucate, which agreed with (Erdtman, 1952 and Mostafavi and Mehragan, 2013), While Perveen and Qaiser (2006) reported that the ornamentation in *M. hybrida* punctate – spinulose. Mostafavi *et al*. (2011) reported that the type of ornamentation was scabrate- punctate in *M. sabalanica* and *M. umbellulifera*. While Gucel (2013) noticed reticulate ornamentation in *M. nifensis*. Considering these statements, we reach a conclusion that pollen micro-morphological studies have considerable role in distinguishing some related taxa at the species rank. It would also be of interest to establish whether the obtained palynological results support classification based on plant morphology.

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