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Full Length Research Paper

Pollen fertility estimation of some sub-tropical flora of Pakistan

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A total of 46 species from 3 monocotyledon and 18 dicotyledonous families were investigated for percentage pollen fertility. The average fertility was 91.15% which showed the general stability of the flora in the study area. In the present research the highest 100% value was observed in *Argyrolobium roseum* (Camb.) Jaub. and Spach and the lowest 66.67% was observed in *Spergularia arvensis* L. The dominant families regarding number of species were: Brassicaceae having six species, whose average fertility was 91.82% and Papalionaceae having five species whose average fertility was 88.79%. The present studies showed that the flora of the area is a stable one.

Key words: Pollen fertility, district tank, sub-tropical flora.

INTRODUCTION

For a taxonomist, the data about fertility of pollen is an important means to differentiate the potential hybrid and parental plant. It is also supportive to conclude the level of fertility/ satiability in vegetation developed under adverse circumstances (Lawrence, 1951). According to Wodehouse (1935), this character, in spite of supplementary information, is also valuable in the improvement of taxonomic status of a species with its particular family. This test can cooperate significantly in solving taxonomic troubles in the cases when taxonomic characters are interrelated with the morphological characters to become a quantitative character. Ravi (1979), also demonstrate that now a days such tests for plants are the plus point in cytological situations and are of specific significance to attract the contributes towards the reality that studies concerning hybrid and its parent plant have provided remarkable information.

The level of hybrid fertility might provide a few signals of the extent of heritable connection among its parents. Broadly, the hybrid among the species of the same genus which are closely allied (as established by ecology and relative morphology etc.) be apt as sterile or having less fertility, while in the cases the hybrid will be more fertile if it is the result of hybridization between taxonomically more strongly correlated species i.e. intra-specific. So it is the indication of relationship among the taxonomic affiliation and fertility of the hybrid. Numerous workers tried to link in vitro pollen fertility with the survival of a plant under its natural environment. Tellaria (1991), also demonstrated that hereditary variation of vegetation can be observed via studding their pollen fertility. Pollen fertility is a significant determinant of whether in a population there will be enough regeneration through sexual reproduction to ensure the survival of that species (Reijieli et al., 2002).

The present study deals with the pollen fertility of sub-tropical region of District Tank, Pakistan, which is located at 32.00°-32.30°North latitude and 70.05°-70.40°East longitude, with an altitude of 320.04 m from sea level (Anonymous, 1998). This area has been largely neglected in botanical studies. The study was confined to evaluate the stability of the flora in the region.

MATERIALS AND METHODS

Fresh material at proper stage was collected from the field and then identified. The anthers were separated from the flower for fertility test and kept in the 70% alcohol and then placed at 4°C until required. It was then dissected in a drop of muntz's acetocarmine.

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Table 1. Percentage Pollen fertility.

S.No	Taxa	Family	Percentage pollen fertility
1.	*Allium cepa* L.	Liliaceae	93.02
2.	*Argyrolobium rosium* (Camb.) Jaub. and Spach	Papalionaceae	100.00
3.	*Asphodelus tenuifolius* Carvan.	Liliaceae	92.59
4.	*Bougainvillea glabra* Choisy	Nyctaginaceae	95.23
5.	*Brassica compestris* L.	Brassicaceae	89.85
6.	*Brassica juncea*	Brassicaceae	97.82
7.	*Calendula arvensis* L.	Asteraceae	89.28
8.	*Capparis deciduas*	Capparidaceae	92.30
9.	*Carum copticum* (L.) Bth,.	Apiaceae	92.30
10.	*Chenopodium album* L.	Chenopodiaceae	98.03
11.	*Chenopodium murale* L.	Chenopodiaceae	83.34
12.	*Cleome brachycarpa* Vahl ex Dc.	Capparidaceae	84.16
13.	*Convolvulus arvensis* L.	Convolvulaceae	73.07
14.	*Coriandrum sativum*	Apiaceae	98.039
15.	*Cynodon dactylon* (L.) Pers,.	Poaceae	90.62
16.	*Cynoglosum lanceolatum* Forssk.	Boraginaceae	88.89
17.	*Cyprus defformis* L.Amoen.	Cyperaceae	93.75
18.	*Datura stramonium* L.	Solanaceae	98.28
19.	*Dianthus caryophyllus*	Caryophyllaceae	96.77
20.	*Euphorbia helioscopia* L.	Euphorbiaceae	75.36
21.	*Fagonia indica* Burm.	Zygophyllaceae	80.48
22.	*Lathyrus aphaca* L.	Papalionaceae	83.334
23.	*Lepidium apitalum* Willd.	Brassicaceae	85.71
24.	*Lycopersicon esculentum* Miller, Gard. Dict.	Solanaceae	93.75
25.	*Malcomia africana*	Brassicaceae	88.89
26.	*Melia azedarach* L.	Meliaceae	86.45
27.	*Melilotus indica* (L.) All	Papalionaceae	80.00
28.	*Ochthochloa compressa* (Forssk.) Hilu	Poaceae	88.89
29.	*Peganum harmalla* L.	Zygophyllaceae	99.00
30.	*Plantago major* L.	Plantaginaceae	94.33
31.	*Plantago ovata* Forssk.	Plantaginaceae	94.34
32.	*Poa annua* L.	Poaceae	85.10
33.	*Polygonum plebijum* R.Br., Prodr	polygonaceae	85.00
34.	*Polypogan monspeliensis* (L.) Desf.	Poaceae	90.90
35.	*Raphanus sativus* L.	Brassicaceae	90.62
36.	*Rumex dentatus*	polygonaceae	85
37.	*Rumex vesicarius* L.	polygonaceae	88.89
38.	*Salix acmophylla* Boiss., Diagn	Salicaceae	71.42
39.	*Salvia aegyptica* L.	lamiaceae	80.00
40.	*Sisymbrium irio* L.	Brassicaceae	98.03
41.	*Solanum surratense Burm.*	Solanaceae	90.91

The anther wall derbies were removed and the prepared slides were observed under the binocular microscope (Model: MX 5200H, Meiji, Techno, Ltd; Japan). The fertility estimation was taken by the Khan and Stace (1999) technique. The percentage was determined by the formula:

Percentage pollen fertility = No. of total pollens / No. of fertile pollens.

RESULTS AND DISCUSSION

In the present studies a total of 46 species from 3 monocotyledon and 18 dicotyledonous families were investigated for percentage pollen fertility as shown in Table 1. The average fertility was 91.15% which showed the general stability of the flora in the study area (Figure 1).

Table 1. Continued.

42.	*Spergularia arvensis* L.	Caryophyllaceae	66.67
43.	*Tribulus teristris* L.	Zygophyllaceae	91.67
44.	*Trifolium alexandrianum* L.	Papalionaceae	89.74
45.	*Vaccaryia pyramedica* Medik.	Caryophyllaceae	92.30
46.	*Vicia faba* L.	Papalionaceae	90.91

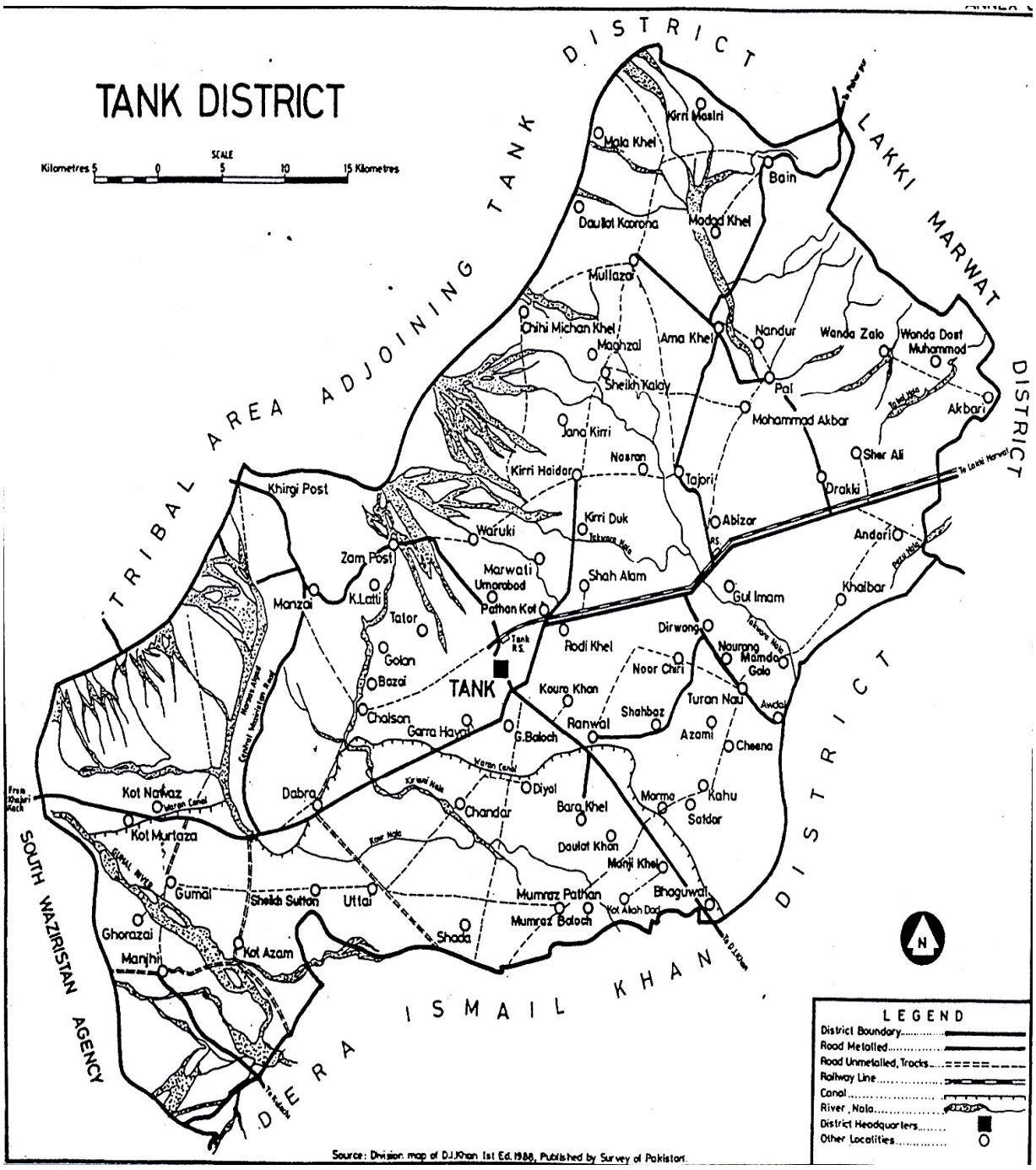

Figure 1. Map of the study area.

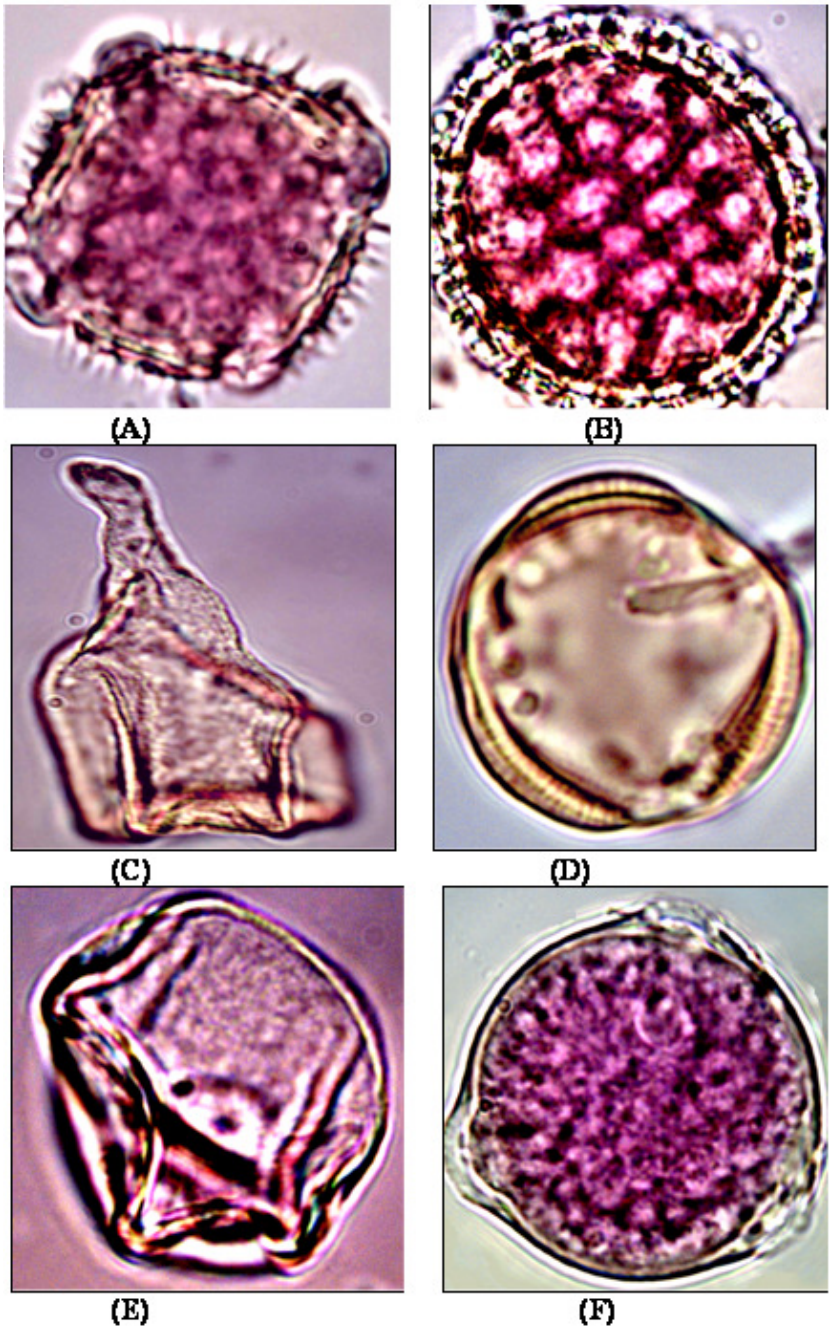

Plate 1. Micro photographs of fertile pollen. A: Polar view of *Calendula arvensis* (100X), B: Polar view of *Tribulus terristris* (100X), C: Equatorial view of *Cyperus defformis* (100X), D: Polar view of *Vaccaryia pyramedica* (100X), E: Equatorial view of *Polypogan monspeliensis* (100X) and F: Polar view of *Vicia faba* (100X).

In the present research, the highest 100% value was observed in *Argyrolobium roseum* (Camb.) Jaub and Spach and the lowest (66.67%) was observed in *Spergularia arvensis* L. The dominant family, regarding number of species, was Brassicaceae having six species whoseaverage pollen fertility was 91.82%, highest 98.02% was observed in *Sisymbrium irio* L. and lowest 85.71% in *Lepidium apitalum* Willd. Papalionaceae had five species whose average fertility was 88.79%. 100% was the highest found in *Argyrolobium rosium* (Camb.)

Jaub and Spach and lowest 80.00% in *Melilotus indica* (L). All the four species of Poaceae had an avarage pollen fertility of 88.87%. The family Zygophyllaceae, Solanaceae, Poly-gonaceae and Caryopyllaceae had three species each, having pollen fertility of 90.38, 94.31, 86.30 and 85.25% respectively.

According to Jennersten and Nilssen (1993), Pollen fertility is obviously reduced in little disjointed populations. Byers (1995), Kerry (1995) and Kerry et al. (2000) investigated the effect of population size on reproduction of some angiosperms. They found serious reduction in reproduction in small population of plants where there was less production of seeds per fruit per plant. They concluded that inadequate number and excellence of pollen is the possible reason for the decreased fertility in miniature populations. Low pollen fertility and reduced seed germination rates in small split populations has also detected by Menges (1991) and Agren (1996).

Reijieli (2002) investigated the pollen fertility status in thirty two species of economic and environmentally important coastal species. Pollen fertility status in these species varied from as low as 38% in Canavalia cathartic to as high as 100% in Hernandia nymphaeifolia and Vigna marina. Qureshi et al. (2002) studied the pollen fertility of Launaea genus from Pakistan. According to them, the pollen fertility is a central feature which helped in determining the victorious adjustment of plant species. Gonzales et al. (1999) studied the pollen fertility estimation of 35 species of genus Solanum which was 68-99%. According to Noor et al. (2004), pollen fertility studies have been modified or helpful for the recognized wide range of variation existing within the species and differentiating plant species with genera. They studied the pollen fertility of 16 cultivated species at University of Arid Agriculture, Rawalpindi, Pakistan which was 68-100%. Zafar et al. (2006) studied the pollen fertility of 3 species of family Verbenaceae from Margalla hills, Islamabad, Pakistan which was 96.14-97.87%. It was concluded from these studies, that the flora was comparatively stable as it showed high degree of pollen fertility.

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