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Pollen Studies in Ber (*Ziziphus mauritiana* Lamk.) Cultivars

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Abstract : Pollen grains of the seven *ber* cutivars were almost similar in their morphology. The fresh pollens appeared as a fine, yellowish powdery mass and were very sticky. They were isopolar, fixiform, radiosymmetric and 3-zonicol porate, with psilate exine. On acetolysis, shape was prolate spheroidal, and in distilled water, roundish and triangular. Pollens were round in acetocarmine and ellipsoidal in castor oil. When moistened, pollen size was increased. Pollen fertility ranged from 68.08% (Seedless) to 87.34% (Darakhi No. 1). Pollen germination as well as tube length was highest in 25% sucrose solution.

Key words : *Ber,* pollen.

Improved cultivars of *ber* have high potentials for good yield per unit area, but powdery mildew and fruitfly are the serious bottlenecks in its successful cultivation. The quality of the existing varieties also needs considerable improvement. Maharashtra has become one of the important states in *ber* cultivation. This centre has 92 *ber* cultivars in collection and intends to undertake hybridization programme to impart powdery mildew and fruitfly resistance. For a planned breeding programme, a comprehensive knowledge of palynology is required, and hence the present investigation was undertaken.

Materials and Methods

The palynological studies were conducted in the Instructional-cum-Research Orchard, Department of Horticulture, Mahatma Phule Agricultural University, Rahuri, during the peak flowering season of 1993-94. For pollen morphological studies, the technique of pollen preparation, as described by Nair (1970) was followed. Erdtman's system (1952) was followed for describing the pollen morphology. Pollen descriptions were based on acetolysed grains. Pollen shape, size (polar view along the longest spore axis at 400 X magnification), fertility (by 1% acetocarmine) and germination (0 to 30% sucrose) were studied in the seven *ber* cultivars (Table 1).

Results and Discussion

Pollen morphology

(a) General appearance and shape : The fresh pollen grains of *ber*, when seen with naked eye, appeared as a fine, yellowish powdery mass and were very sticky in nature. They looked pale yellow, isopolar, fixiform, radio-symmetric and angulaperturate under the microscope. Normal pollen grains of all the cultivars were almost similar in their morphology. They were 3- zonicol-porate having psilate (smooth) exine pattern. Fresh (air dry) pollen were oval to ellipsoidal in shape. Each pollen had 3 semispherical germspores placed equidistantly.

(b) Pollen shape in different media : On acetolysis, prolate spheroidal shape of pollen was seen when mounted in glycerine jelly medium, while it was ellipsoidal (prolate) in castor oil medium. Fresh pollen, when mounted in distilled water, became roundish and triangular, while in acetocarmine (1%), fertile pollen grains became mostly round and plumpy, but the sterile pollen grains became elliptical and shrivelled. These findings are in accordance with those of Chundawat *et al.* (1979) and Patil (1980).

(c) Pollen size in different media : The pollen grains of all the cultivars increased in size when moistened in comparison with the natural size (Table 1).

Table 1. Size of pollen grains (μ) of ber cultivars in different media

Ber cultivar	Natural (Air dry)	Acetolysed pollen mounted in glycerine jelly	Distilled water	Castor oil	Acetocarmine (1%)
Chinese	15.81	21.50	24.52	26.02	20.05
Darakhi No.1	14.94	20.05	18.12	19.57	17.53
Darakhi No.2	19.57	22.15	20.21	21.72	19.71
Guli	17.42	20.43	18.81	25.37	18.49
Seedless	26.66	32.04	30.34	30.34	28.06
Tikri	19.78	23.01	21.71	21.93	21.50
Villaiti	21.50	23.87	24.30	24.30	23.01

When stained with acetocarmine (1%), pollen size was considerably reduced than that observed after acetolysis, in distilled water and in castor oil media. An average size of acetolysed pollen grain (Table 1) measured along the longest spore axis was maximum in Seedless (32.04 μ) while it ranged between 20.05 μ and 23.87 μ in rest of the cultivars indicating smaller variation. As per the classification suggested by Erdtman (1952), pollen grains of Seedless belonged to 'medium size spore class', while pollen grains of remaining six *ber* cultivars belonged to 'small spore class'. Production of bigger size grains in Seedless may possibly be the result of polyploidy. Mass (1977) stated that pollen grains in polyploid species are generally larger than in diploids.

The pollen grains of all seven cultivars showed largest size when moistened in castor oil (19.57 to 30.34 μ) in comparison with the natural size (14.94 to 26.66 μ). When moistened with distilled water, pollen size was slightly increased than acetocormine (17.53 to 28.06 μ). Such variations in size of *ber* pollen were also observed by Singhota (1973), Chundawat *et al.* (1979) and Patil (1980). On the contrary, Daulta and Sareen (1980) reported that acetocarmine did not affect the pollen size and shape.

Pollen viability

(a) Acetocarmine (1%) stain test : Pollen fertility indicated that pollen stainability was high, ranging from 68.08% (Seedless) to 87.34% (Darakhi No. 1). These findings are in close agreement with those of Josan *et al.* (1981).

(b) Pollen germination in vitro : The observations on pollen germination and pollen tube length (Table 2) indicated that though the *ber* pollen could germinate in distilled water alone, the speed of germination and the extent of germination was maximum in sucrose solution. Optimum concentration for all the cultivars to get the maximum pollen germination and tube length was, 25% sucrose solution after 6 hours of incubation, closely followed by 30% and 20% sucrose solutions. The extent of pollen germination and tube length was higher in Tikri (71.73% and 365.30 μ), followed by Darakhi No. 1 (69.0% and 342.28 μ) and Guli (51.83% and 334.11 μ), while it was lower in Darakhi No. 2 (27.02% and 272.79 μ) in 25% sucrose solution after 6 hours as compared with 3 hours of incubation.

Viviparous germination of pollen grains, left in petridish and kept at room temperature (25 to 30°C) for 5 to 6 hours, was also observed in all the *ber* cultivars in the present study.

Table 2. Germination (%) and tube length (μ) of ber pollen in sucrose media

Cultivar	Hours after pollen planting	Concentration of sucrose solution									
		Distilled water		15 per cent		20 per cent		25 per cent		30 per cent	
		Germination	Pollen tube length	Germination	Pollen tube length	Germination	Pollen tube length	Germination	Pollen tube length	Germination	Pollen tube length
Chinese	3	4.4	75.6	9.7	192.2	11.1	205.5	12.5	245.9	11.6	220.5
	6	9.5	201.2	16.3	307.4	16.6	327.2	28.4	333.2	14.7	303.5
Darakhi No. 1	3	14.8	129.0	32.2	213.7	45.7	277.3	58.5	261.8	46.8	257.4
	6	27.0	184.4	40.0	221.4	45.9	293.2	69.0	342.2	52.1	304.0
Darakhi No.2	3	2.2	54.8	3.1	148.3	5.0	186.1	13.3	199.2	7.4	154.8
	6	7.8	103.2	8.5	195.2	15.6	261.0	27.0	272.7	18.2	230.0
Guli	3	10.0	168.9	27.5	176.3	34.0	184.9	46.1	265.3	35.0	243.3
	6	16.6	230.0	45.4	248.1	46.3	250.6	51.8	334.1	47.7	310.0
Seedless	3	4.4	75.6	6.2	116.2	14.8	129.0	34.3	133.3	16.6	125.5
	6	6.2	106.2	18.8	126.4	23.6	138.4	42.2	162.2	21.2	127.2
Tikri	3	3.1	167.2	30.3	205.9	32.3	223.6	33.3	245.1	30.3	166.8
	6	13.8	192.2	31.1	278.2	47.0	285.9	71.7	365.3	42.1	270.4
Villaiti	3	7.4	104.0	10.1	175.0	11.1	189.9	21.2	249.8	16.3	206.4
	6	10.2	224.2	16.0	287.6	16.8	290.6	32.2	315.6	22.5	303.1

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