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Assessment of the Germplasm of Rosaceous Fruits Under Cultivation in Kashmir Valley and its Environs III. Floral Biology of *Prunus persica*

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Varieties of peach cultivated in Kashmir Valley exhibit uniform altemate pattem of fast, slow and against fast development of floral buds. All the varieties bloom within about ten days of one another. They are categorized into early and late blooming types. The former always flower almost a week earlier than the latter. Representatives of both these categories exhibit annual fluctuation in the time and duration of bloom. Stigma receptivity lasts for about a week but the peak is reached on the day of anthesis. Anther dehiscence synchronizes with the time of stigma reseptivity creating conditions conducive to self pollination. Bagging experiments reveal that the various varieties set appreciable quantities of fruit on selfing, reflecting their self fertile nature.

Key Words - Anther Anthesis Floral-bud Pollination Stigma.

Kashmir valley hosts a dozen edible and four ornamental varieties of peach (*Prunus persica Batsch*). For the genetic improvement of these varieties, knowledge of some aspects of their floral biology such as floral bud development, time and duration of flowering, stigma receptivity and anther dehiscence, pollination mechanism and breeding system are imperative. Data collected on these aspects are presented in the present communication.

MATERIALS & METHODS The names and sources of the varieties studied, are listed in Table 2. Field data on the blooming period was collected by visiting the orchards regularly to record the phase of flowering of selected individuals of each variety. Stigma receptivity was studied by visual observation and pollen germination technique. Photomicrographs were taken with in an Olympus PM6 camera. For observations on breeding system, floral buds were bagged prior to anthesis, and the bags were opened only after flowering in the entire orchard was over.

RESULTS *Floral bud development* Floral primordia appear during August. By the middle of December, the buds develop thick, pubescent scales which help them to remain dormant up to mid February and get activated as the temperature begins to rise in spring. In April, the corolla peeps through the scales marking the commencement of pink bud stage.

In most of the edible peaches, the stigma exert from the pink bud in varying frequencies (Fig.1, Table 1). In all ornamental and the edible varieties, namely Avval-number, Chakli I, Chakli II and Gole II, the stigmas never protrude from the closed buds.

Anthesis Anthesis begins around 8 AM and continues up to 6 PM; the maximum number of flowers open around noon. On the very day of anthesis, majority of anthers within a flower dehisce. The few that do not, discharge their contents the following day. In some flowers, anthers dehisce in advance of the opening of flower.

The time and duration of flowering Data on flowering period collected for three consecutive years (1981-83) are shown in Table 2. The flowering period of an individual has been divided into three phases: (i) the initial bloom, when only about 10% of the total flowers on the tree are open, (ii) full bloom, when more than half of the flowers on the tree are in bloom, and (iii) end of bloom, when 90% or more flowers borne by a tree have shed their petals.

In the varieties explored from the valley, flowering lasts for about a month (Table 2); the ornamental varieties remain in bloom longer than the edible ones. The varieties cultivated in Jammu come to bloom during the second or third week of February, and remain in bloom for about two weeks.

There is hardly any annual fluctuation in the initiation of flowering in the peaches cultivated under the substropical

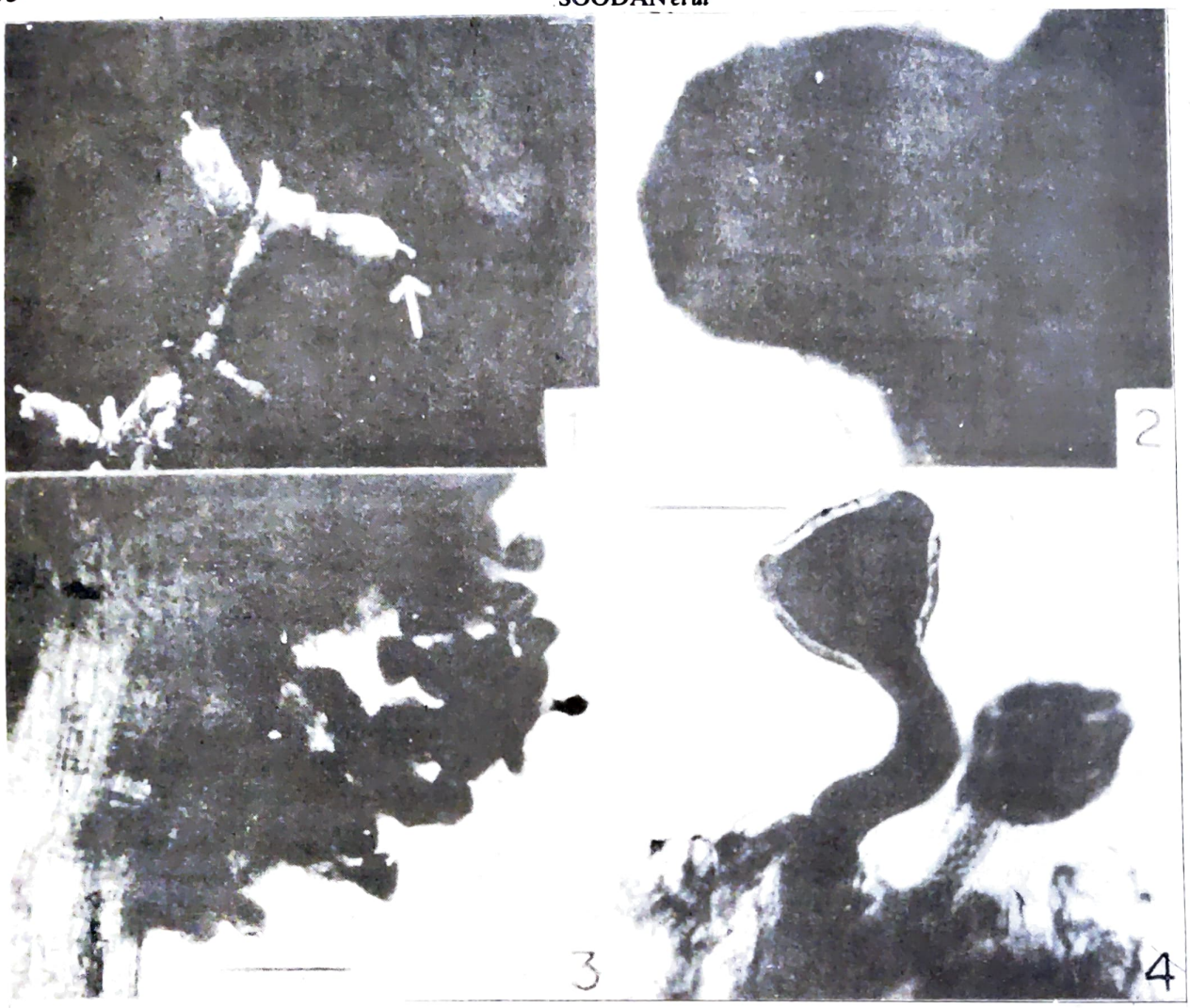

Fig. 1. Floral buds of var. Quetta with exserted stigmas. 2. Stigmatic surface prior to the onset of reception phase. (Bar = 50 μm). 3. A receptive Stigma with a cluster of germinating pollen attached to its surface. (Bar = 50 μm). 4. Enlarged view of a pollen tube penetrating the stigmatic surface. (Bar = 20 μm).

Table 1 - Frequency of Floral Buds with Exserted Stigma

Variety	Number of floral buds scored	Number of floral buds with exserted stigmas	Percentage of flowers with exserted stigmas
Elberta	98	35	36
Silver	102	32	31
Peshawari	82	25	30
Quetta	178	47	26
Lal	100	24	24
Kashmiri Quetta	70	16	23
Aam	176	39	22
Gol I	80	17	21
Avval Number	100	0	0

Table 2 Flowering Period of Some Varieties of Peach from Kashmir Valley and Jammu.

Variety	Name of orchard	Number of trees	Date of initial bloom			Date of full bloom			Date of end of bloom			Duration of bloom (No. of days)		
			1981	1982	1983	1981	1982 1	983	1981	1982	1983	1981	1982	1983
EDIBLE PEACHES														
Chakli I	1	2	15-16	15-17	14-16	19-20	17-19	17-19	26-27	27-28	27-28	11	12	13
Chakli II	1	2	12-13	14-16	12-13	14-16	17-19	15-16	26-27	27-29	26-27	13-14	13	12-13
Gole II	1	6	14-16	16-18	12-14	16-18	20-21	18-20	25-26	28-29	288-29	10-11	11-12	15-16
Peshawari	1	5	14-16	18-20	13-15	18-19	20-22	17-18	28-30	28-30	27-28	12-16	10	13-14
Aam	2	5	1-3	5-7	17-18	2-5	7-9	19-20	11-15	19	27-28	10-13	12-14	10
Avval-number	2	5	6-7	8-11	20-23	8-9	11-13	22-25	20-22	23-24	2-4May	16-18	11-12	9-12
Gol I	2	4	1-3	5-6	17-18	3-4	8-9	19-20	14-16	18-20	27-28	11-15	13-14	10
Kashmiri quetta	2	4	5-6	8-9	17-18	8-9	11-13	19-20	20-23	24-26	29-30	14	16-17	12
Lal	2	2	1-3	6	17-18	4-5	8-10	19-20	14-15	19-21	28-29	12-14	13-15	11
Quetta	2	10	1-3	5-6	17-18	2-5	8-9	19-20	12-15	19-21	27-28	11-13	13-15	9-10
Elberta	3	2	2-3	5-7	17	4-5	8-9	19-20	14-15	19-20	27-29	12	14	10-12
Silver	2	2	1-3	6-7	18-19	4-5	9-11	20=21	15-18	19-22	27-28	14-15	13-15	9
ORNAMENTAL PEACHES														
Acc.I	4	6	9	21	21	12	23	25	3 May	12 May	10 May	24	21	19
Acc.II	4	6	9	21	22	12	23	26	4 May	11 May	11 May	25	19	19
Acc. III	4	5-6	9	22	23	11-12	23-25	26-27	5 May	13 May	12 May	26	21	19
Acc. IV	4	6-7	10	22-23	22	13	25-26	26-28	5 May	12 May	13 May	25-26	20-21	21

Date for the varieties grown in Jammu belong to the month of February and for varieties grown from Kashmir Valley to the month of April except when indicated otherwise.'

1= Daya Singh Nursery, Bohri Jammu; 2= Akram Orchards Ravalpora, Srinagar (Kashmir);

3= Kohli Orchards, Peer Bagh Srinagar (Kashmir); 4= Nehru Memorial Botanical Garden, Chashmashahi, Srinagar (Kashmir)

Table 3. Stigma receptivity of two Edible Varieties of Peach (data collected from two trees of each variety)

Age of stigma	Visual observation method						Pollen germination method					
	Number of stigmas studied		Number of stigmas receptive		Percent receptive stigmas		No. of stigmas pollinated		No.of stigmas showing pollen germination		Percent receptive stigmas	
	Aam	Quetta	Aam	Quetta	Aam	Quetta	Aam	Quetta	Aam	Quetta	Aam	Quetta
—3	85	70	15	12	18	17	50	100	13	20	26	20
—2	70	100	31	43	44	43	45	78	20	38	44	49
—1*	100	68	65	47	65	69	52	78	34	48	65	62
o*	100	100	92	100	92	100	57	86	51	79	90	92
+1*	80	98	60	70	75	71	40	80	22	48	55	60
+2	65	84	33	43	51	51	41	82	16	34	39	42
+3	60	62	14	16	23	26	46	92	14	16	30	17
+4	44	44	4	6	9	14	26	35	3	4	12	11

(—1) One day before anthesis
(0) Day of anthesis
(+1) One day after anthesis.

condition of Jammu but the varieties cultivated in Kashmir valley exhibit remarkable fluctuation (Table 2). Similar difference also exists with respect to the duration of the bloom (Table 2).

Stigma receptivity - Data on stigma receptivity were collected from cvs Aam and Quetta (Table 3) Fig.2-4. In both the varieties, stigmas start entering into the receptive phase three days prior to anthesis, and the receptivity lasts until four days after anthesis; the peak is attained on the day of anthesis when more than 96% stigmas are in the receptive phase.

Pollination mechanism - Peach is among the first few trees to flower in the valley. Insects of various species belonging to families Apidae, Bombidae, Coreidae, Peiridae and Coenoglonidae have been collected from flowers of peaches. Honeybee is the most common pollen vector. Bees visit side branches more often than the top branches.

Breeding behaviour - In order to determine their breeding behaviour, flower buds of edible varieties were bagged. In all the bags, normal fruits containing healthy seed were developed.

DISCUSSION The pattern of bud development observed during the present work conforms to the classification recommended by Jablonskhy (cf. Yadav, 1961). Observations regarding the time of anthesis match Kahlon & Chhatwal's (1978) reports on other varieties.

Extension of stigma from the close buds observed in some varieties is a common feature in peach. Randhawa et al. (1963) reported higher incidence of stigma extrusion in some varieties. Since such stigmas get exposed in advance of anthesis and availability of self pollen, they get involved in cross pollination.

On the basis of their blooming time, the varieties cultivated in Kashmir valley constitute two groups: one comprising cvs. Quetta, Gole I, Aam, Kashmiri-quetta, Lal and Elberta and the second comprising as Avval-number and Acc. nos. I to IV. There is a difference of 4-5 days in the time of their bloom. However, the varieties cultivated at Jammu flower within 3-4 days of one another. Despite the stability of the relative flowering time of different varieties, the actual date of initial bloom of individual trees fluctuates from year to year (Table 1). This variation is probably an outcome of the variation in temperature as proposed earlier by Lawrinowver 1968) and Tabuenca (1977).

The time and duration of stigma receptivity and anther dehiscence are important parameters for the successful accomplishment of pollination. The peak stigma receptivity is attained on the day of anthesis. Maximum number of anthers also dehisce on the same day; the synchrony is ideal for self-pollination. Such synchrony has been reported (Randhawa *et al.* 1963 Singh & Sirohi 1977) for some other varieties of peach.

The varieties set appreciable quantity of fruits on bagging, which indicates their self-fertile nature. However, three varieties, Perhawari, Chakli I and Chakli III are exceptions; being totally male sterile, they are always cross pollinated. The present findings that honeybee and bumblebee are the chief pollen vectors of peach blossoms corroborates the earlier observations of Free (1962) and Griggs & Iwakiri (1964).

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