

Pollen Viability of Some Thai Bananas

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ABSTRACT

Pollen of 11 Thai bananas were kept in capsules at various temperature, which were room temperature (25°C), 10–12°C, and 0°C. Pollen viability was checked every five days by staining in 1% acetocarmine and cultured in Brewbaker and Kwock media. The percentage of germination and viability of pollen at 10–12°C and 0°C were found to be higher than those at room temperature, yet all of them decreased only within a few days of collection.

Banana flowers are produced in nodal clusters, lying under protective bracts until maturity. Initially these bracts are compressed one upon the other at the apex of the inflorescence. After the inflorescence has emerged, the bracts lift successively and usually fall off. The first clusters are female, and male clusters normally continue to produce for several months (Stover and Simmonds, 1987).

The male flowers are around 6 cm. long with 5 stamens, representing 2 whorls, with one stamen in adaxial position, opposite free tepal missing anther long, basifixed, introrse, well developed, but rarely containing pollen in the cultivars; small abortive ovary, about a quarter of the length of flower, with slender style and stigma, entire flowers abscise at base of abortive ovary. The female flowers are 10 cm. long, larger than males, with well-developed, 3-locular, inferior ovary, longer than perianth, ovules numerous in 2–4 rows in axile placentation, style massive with 3-lobed stigma, staminode 5, ovary persistent, but perianth, staminodes and style abscise leaving a callous scar which persists on end of mature fruit (Purselove, 1978; Stover and Simmonds, 1987).

Both male and female flowers produce abundant nectar. The pollen is sticky at maturity, thus suggesting that pollination in banana is entomophilous and animal based. In wild seedy diploid pollination is essential for fruit development. But in cultivar pollination is usually immaterial, because many clones rarely produce

pollen. Further, the tendency for edible clones to produce parthenocarpic fruits is a detrimental feature (Simmonds, 1962). The flowers are naturally visited by bats, birds, ants, bees, wasps and other large insects. The separation of sex prohibits self-pollination within an inflorescence. However, self-pollination between inflorescences on the same stool is not infrequent. Working on pollen viability, Dodds (1943) counted the number of pollen mother cells and pollen grains in whole anthers of 5 cultivars, the result showed that the fertility quite low in Pisang Lilan, Selangor x Calcutta, 206 and 265, but so much higher in Selangor and Long Tavoy (Abxander, 1972).

The present study was carried out to investigate the viability and the method to store the pollen. The longevity and fertility of the pollen grain will be very useful in banana breeding.

MATERIALS AND METHODS

The pollens of 11 banana cultivars were collected from Banana Gene Bank at Pak Chong Research Station. The collected pollen were put in the capsule with silica gel and kept at various temperature levels as follows:

- 1) Room temperature (25°C),
- 2) 10–12°C in the refrigerator; and
- 3) 0°C in the refrigerator.

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The pollen germinated in Brewbaker and Kwock medium (Brewbaker and Kwock, 1969). The viability was observed by staining in 1% acetocamine. Observation on the pollen viability and germination percentage has been made at every 5 days interval.

RESULTS

The morphology of pollen were found to be inaperturate type with average size of 135 microns (Fig. 1)



Fig. 1. Morphology of banana pollen grains.

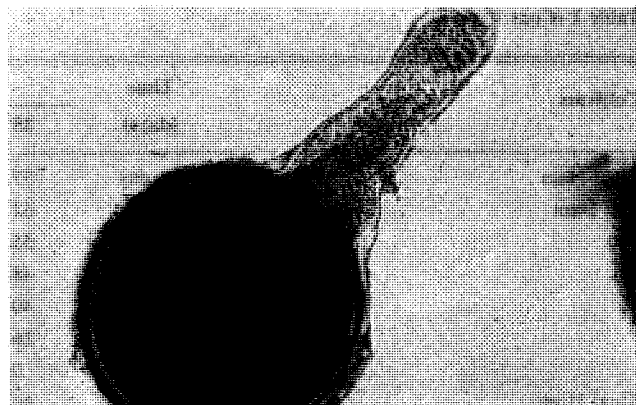


Fig. 2. Germination of the banana pollen.

The pollen viability of 11 banana cultivars were observed at different temperatures of storage. The results are shown in Table 1.

The percent of pollen viability decreased in the time of storage. At 0°C and 10 – 12°C the viability was higher than that at the room temperature (25°C).

The viability and germination (Fig. 2) were observed at the same time, the result of which are shown in Table 1.

Table 1. Pollen viability and germination percentage of 11 banana cultivars

Cultivars	Time (days)	Viability percentage			Germination percentage		
		25° C	10 – 12° C	0° C	25° C	10 – 12° C	0° C
Kluai Khai Boran (3x)	1st day	68.57	—	—	30.42	—	—
	5	54.05	57.05	55.54	24.07	28.92	27.34
	10	37.95	44.68	41.18	19.38	24.45	23.34
	15	31.82	36.67	33.66	7.94	12.11	10.98
	20	13.96	25.49	23.95	0	0	0
Kluai Tani (2x)	30	0	0	0	0	0	0
	1st day	81.30	—	—	46.67	—	—
	5	51.75	62.22	55.28	21.88	29.47	29.09
	10	45.55	51.36	48.32	11.11	15.38	16.67
	15	27.95	42.96	37.57	0	7.41	8.00
Kluai Namwa (3x)	20	13.85	36.96	37.39	0	0	0
	25	3.97	21.43	19.31	0	0	0
	30	0	9.86	8.75	0	0	0
	1st day	95.40	—	—	40.20	—	—
	5	0	0	0	0	0	0
	10	0	0	0	0	0	0
	15	0	78.70	81.50	0	23.70	24.10
	20	0	0	0	0	0	0
	25	0	0	0	0	0	0
	30	0	54.30	69.00	0	7.60	11.70

Table 1 (Cont.)

Cultivars	Time (days)	Viability percentage			Germination percentage		
		25° C	10 – 12° C	0° C	25° C	10 – 12° C	0° C
Kluai Nam	1st day	77.65	—	—	16.12	—	—
Kap Dam	5	62.50	72.12	67.48	9.04	11.98	12.49
(3x)	10	55.85	58.95	60.00	3.14	8.93	9.89
	15	48.04	52.17	55.28	0	0	0
	20	40.54	42.00	45.74	0	0	0
	25	16.22	20.15	21.59	0	0	0
	30	0	13.14	11.59	0	0	0
Kluai Hom	1st day	56.86	—	—	28.57	—	—
(3x)	5	42.95	52.92	55.17	10.45	12.30	15.63
	10	35.32	38.98	47.76	0	2.02	5.13
	15	30.20	32.65	34.04	0	0	0
	20	22.64	27.91	26.83	0	0	0
	25	10.84	15.92	16.25	0	0	0
	30	0	5.48	5.32	0	0	0
Kluai Khai	1st day	68.89	—	—	14.74	—	—
Thong Rong	5	52.70	65.00	54.61	4.03	5.14	8.13
2x AA	10	52.42	44.94	35.33	0	1.04	1.25
	15	21.03	39.58	25.00	0	0	0
	20	7.50	23.70	21.31	0	0	0
	25	0	18.54	10.03	0	0	0
	30	0	4.23	1.05	0	0	0
Kluai Khom	1st day	73.13	—	—	12.25	1	—
Bao (AAB)	5	56.14	56.79	43.08	1.78	2.04	6.84
(3x)	10	20.00	42.11	36.67	0	0	0
	15	10.03	12.62	17.80	0	0	0
	20	4.63	8.62	6.94	0	0	0
	25	0	4.41	5.32	0	0	0
	30	0	0	0	0	0	0
Kluai Leb Mu	1st day	80.39	—	—	30.15	—	—
Nang (AA)	5	43.42	46.97	48.59	18.02	18.42	25.00
(2x)	10	29.29	35.60	33.94	14.29	15.43	15.63
	15	14.61	17.17	18.06	10.81	15.00	14.81
	20	12.10	15.69	19.28	0	9.65	8.70
	25	0	2.81	7.83	0	0	0
	30	0	0	0	0	0	0
Kluai Lai	1st day	77.78	—	—	6.52	—	—
(2x)	5	32.84	37.14	45.33	0	0	0
	10	21.43	32.43	36.30	0	0	0
	15	11.45	15.95	16.24	0	0	0
	20	0	4.23	5.01	0	0	0
	25	0	0	0	0	0	0
	30	0	0	0	0	0	0
Kluai Khai	1st day	57.65	—	—	21.15	—	—
(2x)	5	52.94	53.65	53.42	14.95	16.23	16.89
	10	46.52	52.78	51.03	1.64	1.36	3.33
	15	30.08	43.68	46.59	0	0	0
	20	20.00	33.96	40.40	0	0	0
	25	9.78	19.89	23.47	0	0	0
	30	0	5.92	7.15	0	0	0

Table 1 : (Cont.)

Cultivars	Time (days)	Viability percentage			Germination percentage		
		25° C	10 – 12° C	0° C	25° C	10 – 12° C	0° C
Kluai Nam (3x)	1st day	76.69	—	—	20.29	—	—
	5	56.79	60.15	61.98	11.45	12.00	11.95
	10	48.37	51.94	50.01	4.35	5.13	5.66
	15	35.84	35.41	40.13	0	0	0
	20	26.81	27.14	28.95	0	0	0
	25	10.25	15.81	14.01	0	0	0
	30	0	0	0	0	0	0

The germination percentage was lower than viability of the same cultivars.

As shown in the Table 1, it can be seen that, the percentage of both viability and germination dropped only in a few days unlike the work of Dodds (1943) and Alexander (1972). Therefore, fresh pollen of few hours collecting were work in banana breeding as there is no way to store the pollen grains. Accordingly, inter-country transfer of banana for breeding purpose is in no sound proposition.

For the breeding program, even to self cross pollination, several plants must be grown vegetatively to ensure that male flowers will be available in sufficient numbers when they are needed. The materials essential for breeding like the bags or cages can be used to protect stigmas from all, but only the pollens needed. Controlled pollination is done by lifting the bag each morning and dabbling receptive stigma with pollen, until all the female flowers have been treated. When the female phase is completed, the cage is removed.

CONCLUSION

Percentage of pollen viability and germination were observed at room temperature (25° C), 10 – 12° C

and 0° C. The result showed that, pollen viability on the first day of K. Tani, K. Namwa and K. Leb Mu Nang were higher than 80%, while pollen germinations lower than 50%. The viability of those dropped to 40 – 55% and 0 – 10% on the fifth and thirteenth respectively. The germination was 18 – 25% on the fifth day but dropped to 0% in fifteen days. The pollen viability and germination of the other cultivars, however, were lower than those ones. Therefore, it can be concluded that fresh pollens are needed in the breeding program of banana.

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