

POLLEN VIABILITY FERTILITY IN DIFFERENT APPLE CULTIVARS/SPECIES OF KULLU VALLEY HIMACHAL PRADESH

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In Kullu district of Himachal Pradesh, besides, Delicious cultivars of apple, there are several other cultivars, which are grown by the orchardists. These cultivars although not commercially grown but may act as pollinizers for other cultivars. Hence the present investigations were carried out to study the pollen viability and fertility of cultivars being grown in Kullu valley of Himachal Pradesh.

The present investigation were carried out on 23 cultivars/spp. Namely Jonathan, Royal Delicious, William's Royal, Crimson Gold, malus floribunda, M. robusta Tydeman's Early Balack Ben Davis, Red Chief, Red Gold, Summered, Red Spur. Golden Delicious, Royal Gala. Red Delicious, Molloes Delicious, Yellow Newton, New Fine, Oregon Spur, Richard, Commercial, Granny Smith and Winter Banana of apple in a major growing area of Kullu valley in H.P. during 1997 and 1998.

During the flowering season of 1997 the temperature remained uniform and weather conditions were normal whereas, the temperature fluctuation were observed during the flowering season of 1998.

Pollen collection

Unopened blossom (balloon stage) of each cultivar was taken for pollen collection. Anthers were removed by pinching off the distal portion of petals and then kept on clean sheet of paper properly labeled in the petridishes under partial shade at room temperature. Dehisced pllen grains from matured anthers were collected in glass vials (4.5cm x1.5cm), which were loosely stopped and properly marked.

Pollen storage

The vials containing pollen grains were placed in the dissector containing anhydrous calcium chloride (CaCl₂) and stored in a refrigerator for further use.

Pollen viability and fertility

Pollen viability was tested by using 0.04% Erythrosin B and fertility by 1% Acetocarmine/ Erythrosin B stain was prepared by dissolving 40 mg of Erythrosin B in distilled water and making the volume 100 ml. On the other hand acetocarmin was prepared by dissolving 1g of carmine powder in 45 ml of glacial acetic. Distilled water was added to make a final volume of 100 ml. Boiled the mixture and after cooling, filtered and stored in refrigerator. One or two drops of Erythrosin B were placed on microscopic slide and then pollen grains were dusted, covered with cover slip and examined under microscope after minutes. Unstained pollens were scored as viable. In other case. 1 to 2 drops of acetocarmine solution were added o the pollen mass. The slide was covered with a cover slip and was left as such for few seconds. The excessive stain was subsequently wiped out. The slide was then examined under microscope. Deeply stained pollen grains were counted as fertile while weakly stained or shriveled ones as infertile. Several (4-5) fields were observed in each sample to work out average pollen viability and fertility percentage through both the tests.

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In vitro pollen germination

Pollen germination was recorded in 10% sucrose + 0.5% agar medium at 24.5+10C. Freshly dehiscid pollen grains (stored in anhydrous CaCl₂ container) were placed in small drops of the above medium on coverslips. The cavity slide with petroleum jelly smeared edges were inverted over the coverslip carrying pollen and then placed in petridishes containing moist filter paper to ensure uniform and high relative humidity. Pollen germination was observed after 24 hours.

Pollen viability as ascertained by Erythrosin B test was found to vary from 70.70% in Black Ben Davis to 90.32% in Red Gold in 1997, whereas it varied from 76.86% to 93.52% respectively in the same cultivars in 1998. Bist and Sharma (1986) obtained 81.29 to 90.15% pollen viability in 10 low chilling apple cultivars. However, Isaev and Domracheva (1975) obtained 40-90% viability in 30 apple cultivars (Table 1). Pollen viability estimated through *in vitro* germination test ranged from 60.83% in Royal Delicious to 86.31% in Red Gold in 1997, while it varied from 71.25 in Royal Delicious to 89.43% in Golden Delicious in 1998. Almost similar levels of *in vitro* pollen germination ranging from 69.49 to 89.90% in 10% sucrose solution has been reported earlier in some scab resistant cultivars (Kumar 1996). Also the results on pollen viability estimated through *in vitro* germination in present study were in congruous to that of Vondracek (1963), Okuse (1972) and Sharma and Bist (1987).

On the other hand, pollen fertility determined by acetocarmine ranged from 74.35 in Black Ben Davis to 86.38% in Golden Delicious in 1997 whereas, in 1998 it varied from 73.23% to 89.91% respectively in the same cultivars. Pollen fertility ranging from 68.54 to 93.54% in six scab resistant cultivars has been reported by Kumar (1996). This yearly variation in the pollen viability and fertility in the present study may be attributed to the influence of prevailing climatic conditions, altering the physiology of pollen grains at the time of pollen collection. Taking into account the findings of past workers, it can be safely concluded that all the cultivars/species, included in present study exhibited optimum pollen viability thus indicating their suitability for use as pollinizers, notwithstanding their cross-compatibility with each other.

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Table 1. Pollen viability and fertility in different apple cultivars/Species in Kullu valley

Cultivars/ pollinizers	Viability (%) In Erythrosin B (0.04%)		*In 10% sucrose+ 0.5% agar medium		Fertility (%) in 1% Acetocarmine	
	1997	1998	1997	1998	1997	1998
Jonathan	80.67	86.89	73.13	79.30	79.37	82.59
Royal Delicious	76.96	82.34	69.83	71.25	76.19	79.32
William's Royal	80.20	85.02	79.84	82.59	80.28	83.04
Crimson Gold	75.97	80.23	72.75	78.29	76.06	78.25
Malus floribunda	85.18	91.29	83.68	86.96	80.38	87.38
Mlrobusta	88.01	93.12	85.21	88.03	82.51	89.32
Tydeman's Early	81.45	86.53	76.11	81.08	78.93	83.93
BlackBen Davis	70.70	76.87	79.81	84.34	74.35	73.23
Red Chief	86.27	89.65	80.92	84.18	85.61	85.83
Red Gold	90.32	93.52	86.31	88.70	84.23	89.33
Summered	83.96	86.55	80.00	82.45	79.59	83.47
Red Spur	81.75	86.39	80.06	82.92	76.69	85.52
Golden Delicious	89.04	92.06	84.90	89.43	86.38	89.81
Royal Gala	87.52	89.23	84.42	82.05	85.71	85.07
Red Delicious	87.52	89.01	82.92	84.53	85.15	84.26
Mollies delicious	87.05	90.25	81.064	85.26	86.18	87.93
Yellow Newton	85.61	87.35	79.24	84.75	81.52	84.30
New Fine	84.74	88.90	81.69	85.02	78.57	83.26
Oregon Spur	85.24	90.32	80.95	83.74	82.22	84.75
Richard	84.55	86.40	78.02	82.55	83.24	82.38
Commercial	85.94	89.92	79.36	85.24	81.13	85.08
Granny Smith	83.46	87.08	80.04	82.12	80.70	84.72
Winter Banana	85.16	86.30	79.83	82.10	80.50	82.32

* Observation recorded after 24 h. of incubation at 24.5 + 10C