Physiology of Fruit Trees

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Fruit Set

- Fruit set: Transition of ovary to a rapidly growing young fruit which is initiated after successful pollination and fertilization.

  Fruits set (%)=(Number of fruits set / Total number of blossoms) ×100

- Initial fruit set occurs shortly after anthesis and is associated with the beginning of swelling of the ovary.

- Final fruit set refers to the number of fruits on a tree when the fruits and seeds are mature (Harvest time)

Normal fruit set

- Orange: 2% (0.1-3.1%)

- Mango: 1% (inflorescence contain 500 flowers)

- Avocado: > 1%

- Deciduous fruit trees: 5-20%

  Sour cherry 20%

   Apple 5%

Factors affecting the fruit set

- Pollination

- Defoliation (in apple 75-100 cm^2)

- Environmental factors
   - Temperature
   - Humidity
   - Wind
   - Rainfall
   - Light

- Cultural Practices
   - Nutrition (Nitrogen)
   - Fungicides application (captan, high pH)
   - Pruning
   - Ringing

Factors affecting the fruit set

- Genetic factors
  - Ovule longevity
  - Rootstock
  - Mutation (Starking 34; Starkrimson 55; Idaho Spur type 106 fruits/100 cluster)

- Plant Growth Regulators
  - Auxin (BNOA, 4CPA, IAA)
  - Gibberellin (GA_4 , GA_2 , GA_7 > GA_{13}, GA_{14} > GA_1,GA_3,GA_5,GA_{10})
  - Cytokinin (BA)
  - Ethylene
  - Polyamines

Table 1. Effect of various plant growth regulators on fruit set.

Sr. No.	Fruit (variety)	PGR	Dose	Time of spray	Impact	Reference
1	*Grewia sub-inequalis* (Phalsa)	NAA	25 ppm	Twice (first spray at pre bloom and second spray at post bloom stage)	Increased number of flowers per shoot, fruit set and number of fruits per node	Debnath (2010)
2	Bael cv. Pant Shivani	NAA	20 ppm	Twice (1st after seven days of initiation of growth & 2nd spray in last week of June)	Increased fruit set	Uniyal (2011)
3	Pear	GA_{4+7}	3%	Young Fruit period	Improved fruit set, growth& final fruit size	Chen et al. (2012)
4	Mango cv. Keitt	NAA GA_3	25 ppm 25 ppm	NAA at full bloom &GA_3 a week later	Increased fruitset& number of fruits per cluster & per plant	Nkansah, Ofosu-Amin, and Marouli (2012)
5	Almond	Brassinolide	0.1ml/l	Full bloom stage	Increased fruit set	Sotomayor, Castro, Velasco, and Toro (2012)
6	Wax Apple	GA_3	30 ppm	Small bud and petal fall stage	Maximum fruit set percentage	Tuan and Ruey (2013)
7	Pear cv. Williams	GA_{4+7} + 6BA	6 mg/L	At full bloom	Increased fruit set	Luz et al. (2014)
8	Almond cv. Non Pareil	Kinetin	50 microlitre/L	During bloom at pink bud stage	Improved percentage of fruit set	Maita and Sotomayer (2015)
9	Cape gooseberry cv. Aligarh	NAA	15 ppm	At fruit set	Improved fruit set percentage	Kaur and Kaur (2016)
10	Papaya cv. Red lady	GA_3	200 ppm	30, 45 and 60 days after planting	Improved fruit set percentage	Hazarika, Sangma, Mandal, Nautiyal, and Shukla (2016)
11	Sapota cv. Kalipatti	NAA	125 ppm	During flowering and at pea stage	Maximum fruit set percentage	Kaur (2017)
12	Custard apple	NAA GA_3	100 ppm 75 ppm	Flowering and fruit set stage (Twice)	Increased the number of flowers/shoot; Highest fruit set percentage	Dhananjay (2017)
13	Custard apple	GA_3	75 ppm	Twice (1st at flowering stage & 2nd at fruit set stage)	Increased percentage of fruit set	Mahorkar, Naglot, Navsare, and Chavhan (2018)
14	Dateplam cv. Barhee	GA_3 BAP Boric acid	100 ppm 100 ppm 250 ppm	Twice (1st at depressed period of fruit growth and 2nd one month after fruit)	Increased fruit set	Ashour, Mostafa, Saleh, and Hafez (2018)

Parthenocarpic Fruit Set

- Fruits are set and mature without seed development and without fertilization of an egg
  parthenocarpic fruits (figs, banana, pears, …)
    - Vegetative Parthenocarpy (without pollination; banana, Washington naval orange)
    - Stimulative Parthenocarpy (pollination stimulates fruit development; Grape)

- Pear (Genetic and Environment)
  - No Parthenocarpic (Pap Pear)
  - Parthenocarpic fruits is shed at time of June drop (Hardy)
  - Variably Parthenocarpic (Bosc, Bartlett)
  - Consistently parthenocarpy (Arabitka, Pringall)

Stenospermocarpy

Fruit growth that is stimulated by the fertilization of embryo sacs followed by a failure of seed development (Seedless Grape)