The Pharma Innovation Journal 2022; 11(2): 1165-1168

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 1165-1168

www.thepharmajournal.com
Received: 04-12-2021
Accepted: 16-01-2022

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Causes and control of flower drop in fruit crops: A review

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Abstract
The Yield of fruit tree crops are determined with the aid of using flowering efficiency and successive fruit set from the ones flowers. Many factors of the abscission manner were reviewed with inside the past but in this review, we discussed the causes and control of flower drop in fruit trees. Abscission has been defined as the natural process of detachment of parts of a plant from the main body of the plant. In other words, we can say that it is a natural feature or characteristics of plant development which incorporates the loss of fruit, leaves, sepals, stamens, petals, style and flowers. Numerous studies have shown that the various causes of fruit drop that highlights the high Abscisic acid (ABA) content and low Indole-3-acetic acid (IAA) and low deliver of photosynthate and improper Nitrogen application, improper fertilization, Auxin deficiency, heavy crop load. The reduction of this problem has been successfully controlled through the application of some plant growth hormones including GA3 with Zn and ethylene and 1-MCP. The research revealed from the findings that the major reasons of flower detachment is related to ethylene production in a specific amount. And also, the status of the leaf NPK is not the main concern of flower drooping/ drop.

Keywords: Flower drop, flowering, control, PGR, fertilizers

Introduction
In current scenario the level of fruit production is falling, there are multiple reasons that are affecting the rate of production such as dropping of flower before maturation of fruit, or infected by different disease, or else attacked by pests, all these causes no doubt affecting yield of fruit crops that ultimately lower down the overall net production, like in citrus 80 – 90% of all flower drops due to the nutrient shortage or inadequate environment conditions, and in pomegranate, there are number of reasons of flower drop like by pests, disease, cold temperature and lack of pollination. So, taking all these issues into consideration it became a matter of research how these issues can be deal, and at this point finding how? all the force came into action of research so the basic consideration over all the causes is flower drop. Flower drop is has a serious impact on crop yield as loss in flower cause loss of fruit which directly result in yield loss cause serve economic loss in the horticulture industry (GD Ascough *et al*., 2005). That's simply means that crop success or failure depends flowers (Kofi *et al*., 2014). Flowers are dropped due to many reasons which include internal and external factors such as wounding in plant or invasion of pathogen, fluctuate or unbalanced environmental conditions Flowers are also discarded by plants after pollination. (GD Ascough *et al*., 2005). Dropping of reproductive organs male flowers or bisexual flowers is common in various species most time's petals fall but varying in species cause variation in floral part drops such as styles, sepals, styles and stamens. (Wouter *et al*. 1997). There can be numerous reasons that promotes flower drop either physiological disorder or environmental issue, so let's focus onto main factors of flower drop and techniques to tackle those factors.

Review of Literature
Causes of flower drop in fruit crops
- Application of irregular Nitrogen,
- Poor fertilization,
- Climatic factors (wind, rainfall etc.)
- Massive crop load,
- Uneven ripening
- Internal auxin deficiency

According to Luis *et al.* (1995) [18], directly or indirectly the photosynthates and nutrition effects physiological flower abscission. Whereas, Dunlap *et al.* (1996) [9] concluded that changes that occur in regulation of hormones at abscission area results in flower drop. And Bangerth, (2000) [1] concluded the development in flower to fruit that can be harvested generally impacted by limited reservoir or supply of photosynthates and low level of nutrition than optimal requirement.

Rai *et al* 2013 [27], studied the flower and fruit ABA, IAA and carbohydrate contents in relation to flower and fruit drop on Mangosteen trees, and observed that the abscised flowers and fruits had a high ABA content, low IAA, and low supply of photosynthate (low total sugar content in the leaf tissue).The excessive abscission flowers and fruits might have been caused by high ABA content, low IAA and a low supply of photosynthates. Based on these results- application of synthetic IAA accompanied by applying good agricultural practices were recommended to prevent mangosteen flower and fruit abscission.

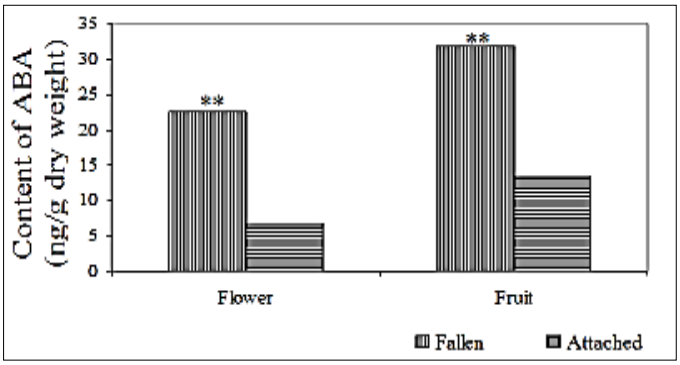

Fig 1: Difference in ABA content between abscised flowers and retained flowers

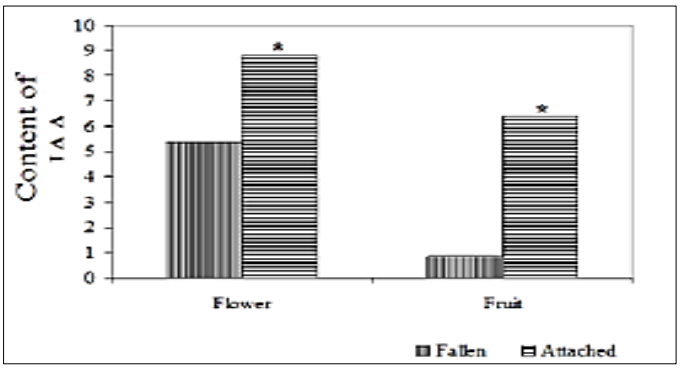

Fig 2: The difference in IAA content between abscised flowers and retained flowers (left)

Role of PGRs in Flower drop

Jawanda *et al.* (1974) [16] studied the effect of growth regulators on floral bud drop in fruit characters of Thomson Seedless grape, and observed that low floral drop with application of $GA_3$20 @ 20 ppm and IAA @ 20 ppm.

Table 1: Effect of growth regulators on floral bud drop in Thompson Seedless grape EinFluβ von Wachstumsregulatoren auf das durchgreifen von Blutenknospen bel Thompson seedless

Concentration (PPln)	Floral bud drop (%)			
	S_1	S_2	Mean	
GA_3	5	64.10	69.58	66.84
	10	61.79	68.17	64.98
	20	46.91	57.45	52.18
	50	55.28	61.94	58.61
IAA	2.5	62.58	73.67	68.12
	5	61.16	68.18	64.67
	10	56.32	64.30	60.31
	20	42.40	49.72	46.06
PCPA	2.5	71.26	73.62	72.44
	5	68.33	72.94	70.63
	10	65.87	71.65	68.76
	20	55.25	63.98	59.61
Control	78.02	77.33	77.67	.
Mean	60.71	67.12		

C. D. at Mb: Concentrations = 16.26
Stages = NS
interaction = NS

Saleem *et al*. (2008) [29] considered the development controllers application influences vegetative and regenerative behaviour of 'Blood Red' sweet orange. They wind up that GA @45 mg/l application diminished bloom drop as well as natural product drop.

Eman, *et al*. (2007) [12] considered the impact of GA3 and Zinc splashes for ameliorating yield and fruit quality of Washington Navel Orange trees developed beneath sandy soil conditions. In this ponder they concluded that application of GA3 @ 10 ppm with Zn decreases natural product drop % and increment in yield of plant.

Sun Y (2009) [36] studied the Impacts of ethylene and 1-MCP (1-methylcyclopropene) on bud and blossom drop in mini-Phalaenopsis (orchid) cultivars, and watched that the ethylene inhibitor 1-MCP (1-methylcyclopropene) diminished ethylene-induced flower bud drop. 1-MCP pre-treatment restrained the ethylene-induced increment in ABA levels effectively. 1-MCP can anticipate ethylene activity and repress senescence forms such as reduced water substance, increased membrane penetrable and uplift ABA content.

Conclusion

The immoderate abscission of mangosteen flowers and fruits might have been caused by high ABA substance, low IAA and provide low supply of photosynthates, low supply of photosynthates was appeared by the lower sugar substance, takes off from the shoots with abscised flower and fruit than for those with held blossoms and fruit and on the other hand clears out N, P, and K status that did not impact flower and fruit abscission. In order to lower the rate of abscission it is profoundly suggested to keep up the level of photosynthates and IAA content as specified by analyst. The rate of abscission in different fruits (Washington navel orange, Blood red sweet orange and Thomson seedless grape) are brought down by utilizing GA, IAA and 1-MCP at distinctive rate so amid generation and postharvest periods of fruits, these components ought to be kept in arrange to extend yield and have great quality gather and as well as variables related to ethylene can be the potential reason actuating flower drop so, ethylene content should also be kept in the consideration for keeping the rate of abscission low and rate of yield high.

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