International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133; Print ISSN: 2664-7125; Impact Factor: RJIF 5.28
Received: 25-09-2020; Accepted: 10-10-2020; Published: 29-10-2020
Volume 2; Issue 4; 2020; Page No. 249-250

Use of chemicals in fruit crops for dormancy induction: A Review

Harpreet Singh*
*Department of Fruit Science, College of Horticulture and Forestry, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan Himachal Pradesh, India

Abstract
There is a fast rate in the change in the climatic conditions. With the change in the weather conditions, the behavior of plants and the trend in their growth also changes. The growing of temperate fruit crops with low chilling requirement in the sub-tropical areas is being practiced at many places. The sufficient period of rest is important for the deciduos plants to bloom and bear the fruits. The dormancy in these plants is not attained at right time due to warmer sub-tropical climates. Thus, following this plants also show delayed flower and fruit bearing. Thus, manual application of chemicals for the defoliation of these deciduous plants is being practiced at many places to make plants enter into dormancy at right time. Chemicals like Urea, zinc sulphate, copper sulphate, HCN etc showed variable results in induction of dormancy in these fruit plants. Some work pertaining to this has been review under in the article.

Keywords: Chemicals, dormancy, induction, fruit crops

1. Introduction
The successful production of deciduous fruit crops under warm climatic conditions is limited by insufficient winter chilling (Couvillon, 1995) [1]. It is considered that the leaves may have the primary role in the induction or progression of bud dormancy. In the late season or late maturing cultivars, the bud break may be late due to delay in the induction of dormancy in the plants. Thus, later the plants enters the dormant stage, later these plants will show the bud break. Certain chemical treatments may be helpful in this regard which when applied to these plants help them to shed their leaves and attain dormancy earlier. The sufficient rest period is necessary for the plants to show uniform bud burst. Hence, sooner the leaf fall occurs, earlier they will enter the rest period and show timely and uniform, synchronized bud break. Delayed leaf emergence, prolong flowering period and non – homogenous bud break are problems of deciduous fruit trees which are initiated by warm winter climate. In areas where there are only low levels of chilling can lead to poor lateral branches and buds through terminal bud dominance. Even in areas that receive chilling close to these levels, reduced bud break, prolonged flowering, lower fruit set and uneven fruit size can occur due to "delayed foliation" (Chauhan *et al*., 2018). Information pertaining to work done on the effect of chemicals on induction of dormancy in the plants and their cropping behavior is reviewed in the article.

2. Impact of chemicals on the induction of dormancy, bud break and cropping behavior of fruit crops
George and Nissen (1987) [3] conducted an experiment to study the effect of cincturing, defoliation and summer pruning on vegetative growth and flowering of custard apple in subtropical areas. The treatments used were control, pre bud break chemical defoliation, post bud break chemical defoliation and summer pruning. trees were defoliated with the mixture of 250 g urea and 1 g/L 2 chloroethylphosphonic acid plus wetting agent (Agral, 60 0.5 ml/L). The result of the study indicated that pre bud break defoliation of African Pride trees was highly effective in inducing early flowering. Natural defoliation and bud break of custard apple tree occurred over 3-4 months. Complete defoliation of the trees that were sprayed before bud break occurred 8 weeks earlier than in control trees. Bud break of these trees also showed similar trend. With both defoliation treatments, severe leaf burn was observed within 1 week of application of the defoliant and 80% of the leaves were shed within 4 weeks of application.
Fallahi *et al*., (1990) [4] carried out an experiment to study the effect of various chemicals on dormancy, maturity and thinning of peaches. The chemicals used were zinc sulphate @ 5%, copper sulphate @ 10% and urea @ 10% in September, October, November, December and January and then thidiazuron @ 100 and 300 ppm in December and hydrogen cyanamide @ 3% and 5% in late September, October, November, December and January. The results of the study indicated that all the chemicals other than thidiazuron defoliated the peach trees. Copper sulphate @ 10% defoliated the trees after 2-3 days while HCN @ 5% caused leaf burning in 24 hours. Defoliating effect of urea 10% and zinc sulphate 5% was less severe. Late November application of HCN induced full bloom about 10-14 days earlier than other treatments. Urea @ 10%, thidiazuron @ 100 and 300 ppm and copper sulphate @ 10% advanced bloom by 2-3 days.
Guak *et al*., (2005) [5] aimed to study the effect of urea and plant bioregulators on cropping of sweet cherry. The treatments used were urea @ 0, 2, 4 and 6%, ethephon 200 ppm or promalin (250ppm BA + 250 ppm GA_{4+7}). The results of the study indicated that defoliation was advanced by ethephon by about 5 days and delayed by ethephon about 34 days. Urea alone delayed defoliation at all concentrations. Higher rate of urea i.e. 4% and 6% enhanced defoliation. Time of bloom was delayed by ethephon treatment and advanced by promalin treatment by one

day as compared to control. Also, fruit set was increased by promalin treatment (i.e. 95 fruits per 100 floral buds).

Mahrous and El-Fakhrani (2006) [6] carried out an experiment to study the effect of some rest breaking agents on productivity and fruit quality of apricot. The chemicals used were zinc sulphate @ 5%, dormex @ 1% and urea @ 5%. The results of the study indicated that among the tested chemicals, zinc sulphate @ 5% induced the earliest bud break in both seasons by 17 and 12 days as compared to control. In addition, hydrogen cyanamide @1% and urea @5% advanced bud burst by 11 days in first season and 10 and 8 days in second season. The highest bud opening percentage in both season was resulted from zinc sulphate at the rate of 5%. HCN @ 1% and urea @ 5% advanced bud burst by 11 days in first season and 10 and 8 days in second season, respectively. The percentage fruit set was generally increased by the tested chemicals in comparison to control. The highest percentage of fruit set (17 and 18%) in the first and the second season, respectively was obtained when zinc sulphate @ 5% was applied, which was accompanied by yield of 123.3 kg and 120 kg/tree, respectively. The control showed 9 and 10% fruit set with yield of 65.7 and 75.5 kg/tree respectively in both seasons. The fruit diameter was increased by zinc sulphate and urea application in the second season only. The significant decrease in the fruit acidity (1.50 and 1.53%) and increment in TSS (18 and 18%) was only shown by the zinc sulphate@ 5% treatment in both seasons, respectively.

Hegazi (2012) [7] carried out the study on Canino apricot cultivar to determine the effect of some chemicals on cropping characteristics of the plant. The treatments applied were urea @ 5, 10 and 15%, zinc sulphate @ 5, 10 and 15%, hydrogen cyanamide @ 1, 2 and 3% and control. The results of the study indicated that in the first season, full bloom and harvesting time were significantly late (90.33 and 149 days) in comparison to control, while the earliest dates for full bloom and harvest time were observed with hydrogen cyanamide treatment @ 3% (61 and 133 days). Similiar trends were also observed in next season. Initial fruit set in the first season was significantly higher (23.76, 25.22 and 25.67 fruits/m) with dormex @ 1, 2 and 3% respectively while it was lowest (10.62 and 11.54 fruits/m) with control and urea @ 5%. Final fruit set was highest (21.33, 21.67 and 22.67 fruits/m) with HCN treatment @ 1, 2 and 3% as compared to control (8.26 fruits/m). Zinc sulphate at all concentrstions showed higher initial and final fruit set in comparison to control. Also, fruit characteristics were shown to be improved by the spray of urea and zinc sulphate at different concentrations. Fruit length was significantly higher (5.05, 4.96 and 4.80 cm) with HCN @ 3, 2 and 1%, respectively. Lowest fruit length (3.38 cm) was observed with control. In the second season, fruit length, diameter and weight were significantly higher (5.26 cm, 4.88 cm and 50.33 g) with HCN @ 3% in comparison to control (3.46 cm, 3.56 cm and 23.33 g). Fruit volume and TSS was higher (52.67 cc and 14.90%) with dormex @ 3% in comparison to control (24.48 cc and 10.50%).

Gonzalez *et al*., (2013) [8] aimed to study the effect of foliar application of urea on the advancement of bud break, bloom and harvesting in cherimoya. The treatments used were foliar application of urea @ 8% on 8th January, urea @ 8% on 18th January + HCN 3% on 14 February and HCN @ 3% on 14th February. The results of the study indicated that urea @ 8% in mid-January resulted in an advancement of bud break, flowering and harvesting. After one month of urea application, very few leaves were seen in urea treated plants while complete defoliation of control trees was not observed until the beginning of April. It was also observed that early leaf removal in urea treated trees resulted in bud break being advanced by 3 weeks. Bloom date was also advanced by 2 weeks. Also, early pollination in urea treated trees helped in early harvesting. More than 50% of yield was harvested in the first date of harvesting. 90% of the yield was picked in urea treated trees when control trees harvesting had just been started.

3. References

1. Couvillon GA. Temperature and stress effects on rest in fruit trees: a review. Acta Horticulturae. 1995; 395:11-19.
2. Chauhan N, Sharma N, Mankotia MS. Hydrogen Cynamide (Dormax) impacts on vegetative bud break yield and quality of apple cv. Starking delicious. International Journal of Chemical Studies. 2018; 6(3):1507-1510.
3. George AP, Nissen RJ. Effects of cincturing defoliation and summer pruning on vegetative growth and flowering of custard apple *(Annona cherimola* x *Annona squamosa)* in subtropical Queensland. Australian Journal of Experimental Agriculture. 1987; 27:915-918.
4. Fallahi E, Kilby M, Moon JW. Effects of Various Chemicals on Dormancy Maturity and Thinning of Peaches. Deciduous Fruit and Nut: A College of Agriculture Report, 1990, 121-128.
5. Guak S, Beulah M, Neilsen D, Quamme HA, Looney NE. Effects of Urea and Plant Bioregulators (Ethephon and Promalin) on Tissue Nitrogen Levels Cold Hardiness and Cropping of Sweet Cherry Trees. Acta Horticulturae. 2005; 667:453-460.
6. Mahrous HAH, El-Fakhrani EMM. Effect of some dormancy breaking agents on productivity fruit quality and powdery mildew severity of apricot. Acta Horticulturae. 2006; 701:657-663.
7. Hegazi AA. Effects of Some Dormancy Breaking Agents on Flowering Fruiting and Fruit Characteristics of 'Canino' Apricot Cultivar. World Journal of Agricultural Sciences. 2012; 8(2):169-173.
8. Gonzalez M, Hueso JJ, Alonso F and Cuevas J. Foliar Application of Urea Advances Bud Break Bloom and Harvest in Cherimoya (*Annona cherimola* Mill.). Acta Horticulturae. 2013; 975:269-274.