Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(2): 816-818
Received: 23-12-2020
Accepted: 09-02-2021

Ashish Kumar Lamba
Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Sachin Kumar
Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Satya Prakash
Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Mohit
Department of Plant Pathology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Corresponding Author:
Sachin Kumar
Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Pre-harvest application of chemicals and pesticide on mango and its effects on skin colour

Ashish Kumar Lamba, Sachin Kumar, Satya Prakash and Mohit

Abstract
Skin colour of mango fruits is an important character influencing the marketing of fruits. Better skin colour of fruit makes the commodity more attractive and such fruits fetch better price in the market. In the present study the visible surface colour of treated fruits was recorded at ripening with colour difference meter and Royal Horticultural Society colour chart. The fruits treated with lower and higher concentration of Calcium chloride and Dehydrated Calcium chloride with 0.1% Carbendazim retained better colour (Yellow) during ambient storage as compared to other treatments, whereas the skin colour of fruits treated with higher concentration (3%) of Calcium chloride and Dehydrated Calcium chloride without Carbendazim was yellowish green. The fruits treated with Silver nitrate with or without Carbendazim had skin colour of greenish yellow or yellowish green or yellow with black spot, while the fruits treated with Calcium chloride and Dehydrated Calcium chloride at lower concentration had greenish yellow skin as compared to control fruits which had green skin colour. Addition of Carbendazim in treatments significantly improved the skin colour. The fruits treated with Calcium chloride 2% and Dehydrated Calcium chloride 2% had skin colour of greenish yellow. However, pre-harvest treated fruits with Calcium chloride 3%, Dehydrated Calcium chloride 3%, had yellowish green skin colour. Fruit skin colour of Silver nitrate (with or without Carbendazim) treated fruits was badly affected. In all the fruits treated with Silver nitrate with or without Carbendazim had black spots on fruit skin. For example the fruits treated with pre-harvest treatment of silver nitrate 100-200 ppm with Carbendazim had greenish yellow to yellowish green skin colour with black spots, while fruits treated with 100-200ppm Silver Nitrate 100ppm + 0.1% Carbendazim had yellowish green to yellow skin colour with black spots. When Carbendazim was added in these treatments, the skin colour of fruit was changed from greenish yellow to yellowish green or yellowish green to yellow with skin colour.

Keywords: Mango (*Mangifera indica* L.), chemicals, skin colour

Introduction
Mango (*Mangifera indica* L.) is a dicotyledonous plant having order sapindales belonging to the family Anacardiaceae is juicy, with a single large kidney-shaped seed. The flavor is pleasant, rich and high in sugars and acid. Mango, often considered as king of tropical fruits, is an important fruit crop cultivated in the region. Mango has turn out to be one of the imperative commercial fruit crops in the whole world, being the second largest tropical crop next to bananas in terms of production, acreage, and popularity. Worldwide mango production was estimated at 22.4 million tons in 2000. Because of worldwide distribution of mango production and technologies that control flowering, it is possible to supply fresh mango to worldwide markets year round. The fruit of mango varies in size, and it ranged from hen's egg as the smallest being to the 1.11 Kg weight. The mango fruit having different shape as heart shaped, slender and long, kidney shaped, round and oval. Skin colour of ripened mango fruit can vary and it may be green, yellow, red, yellow green and yellow red. The yellow orange flesh have been surrounded the single flat seed which is contained in every mango. About 0.6% protein, 1.1% fiber has been contained by ripened mango pulp and from the above concentration considerable amount (2-4%) is of starch and calcium pectate has been anticipated to be 0.7%. The human diet can be maintained or balanced by consuming mango which provides up to 64-86 calories of energy to the humans. Chemical preservatives are used for providing the preservation effect to the stored mango pulp. These are also used for the control of microorganisms, or cease the activity of enzymes and also maintain the keeping quality of stored mango pulp. The core producer of the mango is Asia which is contributed about 76.9% of the overall world production, which is followed by America having 13.38% contribution, Africa having 9% and less than 1% contribution each one for Oceania and Europe. The decline in export of mangoes can be attributed to lack of proper post-harvest handling which is yet a significant reason of poor quality of this fruit. Moreover, farmers are not able to determine the proper time of fruit maturity.

In the global market the attractiveness of mango is owing to its stunning colour, striking fragrance, pleasing flavour, good taste and healthy nutritional properties.

When we considered the losses of mango fruit after harvesting especially considering the developing countries, then the 247 post-harvest losses of mango are extremely conspicuous.

The losses are basically due to the mango fruit harvesting at inappropriate maturity, offensive field handling, chilling injury, fruit softening, mechanical injury, decay of mango fruit, lenticels discoloration, squishy tissue, sap burn and pest or disease damage. The basic nutritive and quality losses are occur due to stiff fruit packing, by using inappropriate transportation and meagre field management. Mango fruit are commonly processed into juice or puree form and added to many different types of food systems, including fruit juice blends.

Fruit juice blends containing mango are becoming more popular with the rise of tropical fruit juices. Processed mango products undergo heat treatment, or pasteurization, to destroy all pathogenic and spoilage organisms. Pasteurization is effective in assuring sanitation; however, application of heat treatments can adversely affect quality characteristics with regard to aesthetic and nutritional quality.

Materials and Methods

The present study was conducted in an experimental orchard and post-harvest laboratory of Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut.

The experimental orchard which was located in Horticultural Research Centre (HRC) of the University was maintained healthy following proper orchard management practices. The university is situated on Meerut-Roorkee road (Near Modipuram), about 11 km away from the Meerut city. Geographically, experimental field is located at 290 01 North latitude, 770 45' East longitude and at an altitude of 237.75 meter above mean sea level.

Results and Discussion

Skin colour of mango fruits is an important character influencing the marketing of fruits. Better skin colour of fruit makes the commodity more attractive and such fruits fetch better price in the market.

In the present study the visible surface colour of treated fruits was recorded at ripening with colour difference meter and Royal Horticultural Society colour chart (Table 1).

The fruits treated with lower and higher concentration of Calcium chloride and Dehydrated Calcium chloride with 0.1% Carbendazim retained better colour (Yellow) during ambient storage as compared to other treatments, whereas the skin colour of fruits treated with higher concentration (3%) of Calcium chloride and Dehydrated Calcium chloride without Carbendazim was yellowish green.

The fruits treated with Silver nitrate with or without Carbendazim had skin colour of greenish yellow or yellowish green or yellow with black spot, while the fruits treated with Calcium chloride and Dehydrated Calcium chloride at lower concentration had greenish yellow skin as compared to control fruits which had green skin colour.

Addition of Carbendazim in treatments significantly improved the skin colour. The fruits treated with Calcium chloride 2% and Dehydrated Calcium chloride 2% had skin colour of greenish yellow. However, pre-harvest treated fruits with Calcium chloride 3%, Dehydrated Calcium chloride 3%, had yellowish green skin colour.

Fruit skin colour of Silver nitrate (with or without Carbendazim) treated fruits was badly affected. In all the fruits treated with Silver nitrate with or without Carbendazim had black spots on fruit skin. For example the fruits treated with pre-harvest treatment of silver nitrate 100-200 ppm with Carbendazim had greenish yellow to yellowish green skin colour with black spots, while fruits treated with 100-200ppm Silver Nitrate 100ppm + 0.1% Carbendazim had yellowish green to yellow skin colour with black spots. When Carbendazim was added in these treatments, the skin colour of fruit was changed from greenish yellow to yellowish green or yellowish green to yellow with skin colour.

The findings obtained on skin colour revealed that the fruits treated with Dehydrated calcium chloride and calcium chloride retained better skin colour (Yellow) under ambient condition, while Silver nitrate treated fruits (with or without carbendazim) had skin colour of greenish yellow or yellowish green or yellow with black spots. Skin colour was improved when carbendazim was incorporated in the treatments.

Skin colour of mango fruit is an important character in marketing as it makes the commodity more attractive and fetches handsome return. The fruits treated with Calcium salts namely Dehydrated Calcium chloride and Calcium chloride retained better skin colour.

In comparison with other treatments, the fruits treated with the treatments had yellow skin colour. Singh *et al.* (1993) [6] also observed change in skin colour of calcium treated fruits indicating the relationship of Calcium salts with physiological phenomenon for colour development (Muhammad *et al.* 2008 and Amin *et al.* 2011) [3, 1]. In the present study Carbendazim containing treatments had better effect in retaining yellow skin colour than those treatments containing no carbendazim because of the fact that carbendazim is well known for fungicidal and Cytokinin properties (Skene, 1972, Thomas, 1973, Thomas, 1974, Tripathi and Schlosser, 1977) [7, 8, 9, 10]. As a result, the fruits treated with Carbendazim had slower rate of respiration and transpiration which made the produce less prone to microbial spoilage caused by fungi (Desai *et al.*, 2012) [2].

The fruits treated with pre-harvest application of Silver nitrate in the present study had black spots. Development of black spots on fruit skin in Silver Nitrate treated fruits may be owing to its phytotoxic effect on fruits and foliage at higher concentration (Prakash *et al*., 1997) [5].

It was reported in almond that pre-harvest application of 400 ppm Silver nitrate at half grown fruit stage affected the hull colouration. The almond fruits treated with Silver nitrate at higher concentration had discoloured hulls (Prakash *et al*., 1992) [4].

Table 1: Effect of pre-harvest application of chemicals and pesticide on skin colour in mango

Treatments	Fruit skin colour At ripening
Control (Fresh water)	Green
Calcium Chloride 2%	Greenish yellow
Calcium Chloride 3%	Yellowish green
Calcium Chloride 2% + Carbendazim 0.1%	Yellow
Calcium Chloride 3% + Carbendazim 0.1%	Yellow
Dehydrated Calcium Chloride 2%	Greenish yellow
Dehydrated Calcium Chloride 3%	Yellowish green
Dehydrated Calcium Chloride 2% + Carbendazim 0.1%	Yellow
Dehydrated Calcium Chloride 3% + Carbendazim 0.1%	Yellow
Silver Nitrate 100 ppm	Greenish yellow with black spot
Silver Nitrate 200 ppm	Yellowish green with black spot
Silver Nitrate 100 ppm + Carbendazim 0.1%	Yellowish green with black spot
Silver Nitrate 200 ppm + Carbendazim 0.1%	Yellow with black spot

Fig 1: Pre-harvest treated fruits collected for experimented trees for post-harvest study.

References

1. Amin M, Malik AU, Khan AS, Javed N. Potential of fungicides and plant activator for post-harvest disease management in mangoes. Int. J. Agric. Biol 2011;13:671-676.
2. Desai UT, Kadamb SS, Salunkhe DK. Post-harvest Handling Storage and Processing of Vegetables. In: Vegetable crops, T.K. Bose (Ed.). *Naya Prokash, Calcutta*, India 2012, 752 p.
3. Muhammad A, Aman UM, Muhammad SK, Saeed A. Mango fruit desapping in relation to time of harvesting. Pakistan J. Bot 2008;40(4):1587-1593.
4. Prakash S, Nautiyal MC. Response of almond fruit gummosis to silver salt application. Scientia Hortic 1992;51:329-334.
5. Prakash S, Nautiyal MC. Response of pre-harvest application of CEPA on colouration and post-harvest behavior of Buckinghum apple. Indian J. Hort 1997;53(4):269-276.
6. Singh BP, Tandon DK, Kalra SK. Changes in post-harvest quality of mangoes affected by pre-harvest application of calcium salt. Sci. Hort 1993;54(3):207-208.
7. Skene KGM. Cytokinins in the xylem sap of grape vine canes. Changes in activity during cold storage. Planta 1972;104:89-92.
8. Thomas TM. Growth regulating effect of three benzimidazole fungicide on the germination of celery (*Apium graveoleus*) seeds. Ann. Appl. Biol 1973;74:233-238.
9. Thomas TM. Investigation into the cytokinin like properties of benzimidazole- derived fungicides. Ann. Appl. Biol 1974;76:237-241.
10. Tripathi RK, Schlosser E. Effect of fungicide on physiology of plant. I. Effect of carbendazim (MBC) on biochemical changes and membrane permeability of senescing cabbage and cucumber leaves. *Med. Fac. Landbouww. Rajasksuniv; Gent* 1977;42(2):1073-1080