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Effect of different doses of ethrel on ripening of Banana (*Musa spp.*).

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Abstract

The study was carried out on the fruits of banana taken from Babber fruits and vegetable company, Abohar, Distt. Fazilka, Punjab. The fruits were brought to Agriculture lab, D.A.V College, Abohar. The fruits of each sample were named as T1-Distilled water (1 litre) + 200 ppm ethrel, T2-Distilled water (1litre) + 300 ppm ethrel, T3-Distilled water (1 litre) + 400 ppm etherl, T4-Hot water ($50 \pm 2^\circ\text{C}$) + ethrel-200 ppm), T5- Cold water ($13 \pm 2^\circ\text{C}$) + ethrel-200 ppm, T6-Control. The objective of the study was to evaluate physical characteristics (Fruit colour, pulp to peel ratio, physiological loss of weight) and chemical characteristics (TSS and Titratable acidity) of each sample of banana. The experiment concluded that among the treatments T3 has performed better in parameters like pulp to peel ratio (4.94), physiological loss of weight (6.97%), total soluble solids (21.33 0Brix), titratable acidity (0.24%). Fruit colour was changed from green to uniform yellow with the advancement in the ripening period with the treatment of Distilled water (1 litre) + 400 ppm ethrel.

Keywords: titratable, distilled, ethrel, banana, ripening.

Introduction

Musa belongs to the family Musaceae, it includes bananas and plantains. Around 70 species of Musa are known, with a broad variety of uses. Banana trees come from southeast of Asia. Then, from there they extended towards the India in sixth century. In India banana ranks first in production and third in area among fruit crops. In accounts for 13% of the total area and 33% of the production of fruits. (www.datagov.in) ^[1] The main component of unripe bananas is starch. Green bananas contain up to 70 to 80% starch, on a dry weight bases. During ripening, the starch is converted into sugars and ends up being less than 1% when the banana is fully ripe. The most common types of sugar found in ripe bananas are sucrose, fructose and glucose. In ripe bananas, the total content of sugars can reach more than 16% of the fresh weight. Bananas have a glycemic index of 42-58, depending on their ripeness, which is relatively low. (www.healthline.com) ^[2] Fruit ripening involves physiological, biochemicals and structural changes such as cell wall regulators increased the post-harvest life of fruits by retarding of ripening, senescence, by minimizing the rate of respiration and by reduction in weight loss, ethephon or ethrel (2- chloroethyl phosphonic acid) is a plant growth regulator which stimulates uniform ripening of fruit and reducing post harvest damage (Thapa *et al.* 2017) ^[3]

Materials and Methods

The experiment was carried out at D.A.V. College, Abohar, District Fazilka, Punjab, India. The location coordinates are $30.14'53''\text{N}$ and $74.19'93''\text{E}$. Fruit colour was analysed by observing the fruit visually. For calculating physiological loss in weight, 5 fruits in each replication of a treatment were marked and weighed using weighing machine. The marked fruits were weighed on successive interval after application of the treatment and loss in weight at each interval was expressed as percent of initial weight for every sample. TSS of pulp juice was measured by refractometer, expressed as 0Brix, by a portable hand refractometer. One or two drops of juice were placed on Refractometer prism and 18 percentage TSS on scale is recorded. A known weight of fruit sample was crushed and taken in 100 ml volumetric flask

and volume was made up by adding distilled water. After filtration, 10 ml of filtrate was taken in separate conical flask and titrated against 0.1 N sodium hydroxide using phenolphthalein as an indicator. The end point was determined by appearance of faint pink colour.

Treatments

- T₁ - Distilled water (1 litre) + 200 ppm ethrel
 T₂ - Distilled water (1litre) + 300 ppm ethrel
 T₃ - Distilled water (1 litre) + 400 ppm etherl
 T₄ - Hot water (50 ± 2°C) + ethrel-200 ppm
 T₅ - Cold water (13±2°C) + ethrel-200 ppm
 T₆ - Control

Results and Discussions

Physical Parameters

1. Fruit colour

From the experiment, it has been found that the fruits was uniform yellow colour observed in T₃ (Distilled water 1 litre+400 ppm) and spoiled fruit observed in T (control). Mahajan *et al.* (2009) [4] was studied that the fruit treated with ethylene (100 ppm) and ethephon (500 ppm) developed uniform yellow colour, whereas ethephon (750 and 1000 ppm) resulted in deep yellow colour with black spots on fruit surface leading to over softening of fruit. Thapa *et al.* (2017) [5] was studied effect of ethephon 39% SL on post-harvest quality of tomato fruits. Colour of fruits was observed to be improved with ethephon application and maximized yellow colour development was noticed from fifth day of ripening period.

2. Pulp to peel ratio

From the observations of experiment, it has been found that maximum pulp to peel ratio of the fruits was observed in T₃ (Distilled water 1 litre+400 ppm) that is 4.94 and minimum value was observed in T (control) that is 4.35. Kulkarni *et al.* (2010) [6] was to study on physico-chemical changes during artificial ripening of banana (*Musa sp*) variety Robusta. Fruit treated with 1000 ppm ethrel attained maximum increase in pulp to peel ratio of 2.3 followed by 2.2 in 500 ppm of treated fruits at full ripe stage.

Chemical parameters

1. TSS (Total soluble solids)

From the experiment, it has been found that maximum TSS (Total Soluble Solids) of the fruits was observed in T₃ (Distilled water 1 litre+400 ppm) that is 21.33 and minimum value was observed in T₆ (control) that is 18.18. Chauhan *et al.* (2012) [7] was also found that the maximum TSS content of orange in ethephon 1000ppm (19.5 %) and in control fruits (13%). Moniruzzaman *et al.* (2015) [8] to find out suitable stage of fruit maturity. Half ripen tomato contain the highest quantity of TSS (4.27 %) while it was the lowest (3.83%) in mature green tomatoes at harvest. For all the maturity stages, TSS increased gradually with the advancement of ripening process.

2. Titratable acidity

Titrate Acidity of the fruits was observed in T₆ treatment that is 0.38 and minimum Titratable acidity of fruit was observed in T₃ treatment is 0.24. Singh *et al.* (2014) [9] experiment was carried out for the investigation on the effect of ethrel and different wrapping materials on post-harvest changes of papaya fruits the minimum Titratable acidity was

recorded in ethrel application @1500 ppm while the maximum was recorded in control. Kaur and Kaur (2017) [10] was studied the effect of post-harvest treatment on quality and shelf life of banana CV Grand Naine. The minimum acidity was observed in ethrel 600 ppm during 8days of storage period. The maximum range of acidity in control treatment.

Observations and Tables

Table 1: Fruit colour

Treatments	After 2 days	After 4 days	After 6 days	After 8 days
T ₁	Green	Light green	Greenish yellow	Yellow with small spots
T ₂	Green	Light green with yellow tip	Light yellow	Uniform yellow
T ₃	Green	Light green with yellow tip	Yellow	Uniform yellow
T ₄	Green	Light green	Yellow	Yellow with black spots
T ₅	Green	Yellow with green tip	Light yellow	Uniform yellow
T ₆	Green	green	Yellow with brown spots	Spoil with brown colour

Table 2: Pulp to peel ratio

Treatments	After 2 days	After 4 days	After 6 days	After 8 days
T ₁	3.59	4.78	4.99	5.51
T ₂	3.90	3.99	4.29	4.94
T ₃	4.25	4.39	5.13	5.91
T ₄	3.92	4.22	4.53	4.35
T ₅	3.96	4.13	4.36	4.57
T ₆	4.01	4.38	4.41	4.53

Table 3: TSS (Total Soluble Solids)

Treatments	After 2 days	After 4 days	After 6 days	After 8 days
T ₁	18.36	19.36	21.04	22.01
T ₂	16.93	17.03	18.79	19.07
T ₃	20.76	20.83	21.65	22.01
T ₄	18.46	18.23	19.63	20.03
T ₅	19.06	18.08	19.98	20.04
T ₆	20.03	20.53	21.18	21.06

Table 4: Titratable acidity

Treatments	After 2 days	After 4 days	After 6 days	After 8 days
T ₁	0.42	0.38	0.27	0.23
T ₂	0.39	0.33	0.32	0.26
T ₃	0.33	0.30	0.19	0.17
T ₄	0.45	0.41	0.35	0.33
T ₅	0.36	0.33	0.25	0.23
T ₆	0.41	0.39	0.31	0.27

Conclusion

The present investigation demonstrated that fruit samples of banana collected for the assessment of the physiological and chemical characteristics. Fruits are treated with treatments like T₁-Distilled water (1 litre) + 200 ppm ethrel, T₂-Distilled water (1litre) + 300 ppm ethrel, T₃-Distilled water (1 litre) +

400 ppm ethrel, T4-Hot water (50 ± 2 °C) + ethrel200 ppm), T5- Cold water (13 ± 2 °C) + ethrel-200 ppm, T6-Control. The experiment concluded that among the treatments T3 has performed better in parameters like pulp to peel ratio (4.94), physiological loss of weight (6.97%), total soluble solids (21.33 OBrx), titratable acidity (0.24%). Fruit colour was changed from green to uniform yellow with the advancement in the ripening period with the treatment of Distilled water (1 litre) + 400 ppm ethrel. Thus it had been concluded from above discussion that artificial ripening of fruits with Distilled water (1 litre) + 400 ppm ethrel were best in physical and chemical parameters.

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