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Effect of ethylene absorbant ($KMnO_4$) with different carrier materials for shelf life of banana CV. Nendran

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Abstract
An experiment was carried out to find out the effect of ethylene absorbent ($KMnO_4$) with different carrier materials on shelf life of banana cv. Nendran. The experiment comprised seven treatments *viz*., control and Talc 5g, 10g, 20g and kaolin 5g, 10g, 20g mixed with saturated solution of $KMnO_4$. The experiment was laid out in completely randomized design with three replications. There was significant variation among the treatments in relation to shelf life and fruit quality characters such as color, firmness, weight loss, pulp to peel ratio, total soluble solids. With the progress of storage duration, color, firmness, weight loss, total soluble solids, pulp to peel ratio, disease incidence, content of banana pulp increased, Treatment having 20 g block of both carrier materials increases the shelf life of banana fruits followed by 10 g blocks of both carrier materials.

Keywords: Triclosan, TCS, determination, detection, sensor

Introduction
Banana is one of the most appreciated fruits and is consumed by millions of people around the World as part of their daily diet Banana is rich in carbohydrates; antioxidants like dopamine and minerals like potassium and calcium (Mohapatra *et al*. 2010a). India is largest producer of banana in the world. Banana is perishable fruit. Its round year availability and acceptability makes it very important fruit crop. There are 20-40 % post-harvest losses occur in banana. Which cause large losses to farmers and distributors. Which cause a large losses to farmers and distributors. So there is need to extend the shelf life of banana. $KMnO_4$ potassium per magnate is used as ethylene absorbant. By absorbing ethylne it delays the ripening of fruit. In present study two carrier materials talc and kaolin is used as carrier materials for $KMnO_4$. Keeping all the above fact this study aimed to find out best suitable carrier material for $KMnO_4$ and its quantity for extending shelf life of banana.

Materials and Methods
Potassium permanganate ($KMnO_4$) was used as principle for ethylene absorption and commonly available Talc (Magnesium silicate hydroxide, $Mg_3Si_4O_{10}$ (OH) and Kaolin (Hydrated aluminum silicate, $Al_2Si_2O_5$ (OH) were used as carrier materials. Low density polyethylene bag of 400 gauge was used for packing and sealed with electric sealer. One molar solution of $KMnO_4$ was prepared by dissolving 158 g of laboratory grade KMnO4 in one litre of hot water at 50^{o}C. Ethylene absorbent was prepared by mixing the carrier materials in one molar solution depending upon the treatment. Four hundred ml of one molar KMnO4 solution in one kilogram of carrier material was added for making paste and it was spread in to a sheet and then made into small cubes by cutting with knife. The air dried ethylene absorbent was weighed depending upon the treatment requirement 5 g, 10g and 20 g and placed inside tissue paper and packed in a small polythene pouch with holes of 5mm diameter. Six fruits per replication were packed in 200 gauge polythene bag along with the ethylene absorbent block in pouch and kept under ambient condition for observation. The carrier materials used in the experiment were Talc and Kaolin and the quantity of ethylene absorbent were 5 g, 10 g and 20 g blocks. The experiment was laid in Factorial completely randomized design with two factors, four treatments (including control) and five replications in each. The observation on post-harvest characters like green life, yellow life (shelf life), total soluble solids, and Physiological

loss in weight (PLW), sensory characters like skin colour appearance, flavour, texture, taste and over all acceptability were recorded.

Results and Discussion

Highest green life was observed in 20 g talc when used asabsorbent (15.66 days) followed by 10 g block talc (15.33 days).When kaolin was used as carrier for ethylene absorbent highest shelf life was recorded when 20 g block was used (15.66 days). Highest shelf life was observed in 20 g talc when used asabsorbent (6.66 days) followed by 10 g block talc (5.66 days).When kaolin was used as carrier for ethylene absorbent highest shelf life was recorded when 20 g block was used (6.66days). Similar result was reported by (Dedzie and Orchard, 1997) [2].

The results on the TSS as influenced by the different carrier materials and levels of absorbent are presented in Table 4.13 and Fig. Different levels of treatments significantly influenced TSS. Irrespective of carrier materials used, 5 g talc block showed highest TSS (14.66%) followed by 10g talc (14.20%). Among the carrier materials kaolin showed high TSS (13.80%) was observed in Kaolin 5g. However, it was on par with talc as the carrier material Total soluble solids content increased during storage. Munasque and Mendoza (1990) [7] stated that total soluble solids increased during ripening which is similar to the findings of the present study. TSS value increased gradually.

20 g Talc block showed highest PLW (9.40%) followed by Talc -10g (8.90%). Among the carrier materials kaolin showed high PLW (8.33%) was observed in Kaolin 10g Similar result was reported by Sarker *et al.* (1997) [12]. Panelists indicated that the skin colour appearance was good in all the fruits treated by different levels of talc (3.33) and in kaolin it was between good and very good (3.66) where as in the control colour skin scored between good and very good (3.63) Similar result was reported by Salvador *et al.* (2007) [11].

Texture was influenced significantly by the levels of absorbents. Texture was firm (3.16) in 5g and Kaolin 20 g (4.13) absorbent levels whereas it was between soft and firm for control (3.16). Flavour was influenced significantly by the levels of absorbents. Flavour was firm (4.50) in 10 g talc and Kaolin 5 g (3.70) absorbent levels whereas it was between soft and firm for control (3.16).

The carrier materials used in the investigation significantly influenced the taste. Taste was very good (5.30) and (4.16) when the fruits were treated with 10g and 20 g of talc as carrier material. Taste was very good (4.23) when the fruits were treated with 5g of Kaolin as carrier material. Different levels of absorbents influenced significantly the overall acceptability. Irrespective of carrier materials 10g talc of absorbent was acceptable for taste (4.16). Irrespective of carrier materials 10 g Kaolin of absorbent was acceptable for taste (3.83). The present results also confirm to the findings emanated from the experiments conducted earlier by Esguerra *et al*. (1978) [3]; and Claud and Clavo (1993) [1]. A more practical material KMnO4 on vermiculite has been developed and tested successfully by the Australians (Scott and Roberts, 1966; and Scott *et al*. 1968) [13, 14]. The extension of green life in the fruits packed in polythene bags with ethylene absorbents than the fruits in control without absorbents might be due to reduced ethylene concentration in the treated fruits with ethylene absorbent which could be due to oxidation of ethylene inside the polythene bag to ethylene glycol by KMnO4 (Sherman, 1985) [15]. The extension of green life by using the ethylene absorbent was also reported by many workers (Liu, 1970; Fuchs and Godreiski, 1971; Esguerra *et al*. 1978; Jayaraman and Raju, 1991; Claud and Clavo 1993; Mary, 1997; Nayak, 1999; and Thumburaj, 2004) [6, 4, 3, 5, 1, 8, 10, 16].

Table 1: Effect of ethylene absorbent (Talc and kaolin) on green life and shelf life of Banana C.V. Nendran.

S. No.	Ethylene absorbent blocks and size	Green life (days)	Shelf life (days)
1.	Talc – 5 g	13.66	5.33
2.	Talc – 10g	15.33	5.66
3.	Talc – 20g	15.66	6.66
4.	Kaolin – 5 g	13.33	5.66
5.	Kaolin – 10g	15.00	5.66
6.	Kaolin – 20g	15.66	6.66
7.	Control	11.66	4.66
	S.Ed.	0.59	0.33
	C. D.	1.24	0.69
	F-test	S	S

Table 2: Effect of ethylene absorbent (Talc and kaolin) on TSS and PLW of Banana cv. Nendran.

S. No.	Ethylene absorbent blocks and size	TSS	PWL
1.	Talc – 5 g	14.66	7.33
2.	Talc – 10g	14.20	8.90
3.	Talc – 20g	13.53	9.40
4.	Kaolin – 5 g	13.80	7.63
5.	Kaolin – 10g	13.56	8.33
6.	Kaolin – 20g	13.33	8.10
7.	Control	12.23	3.13
	S.Ed.	0.17	1.11
	C. D.	0.37	2.32
	F-test	S	S

Table 3: Effect of ethylene absorbent (Talc and kaolin) on Skin colour and texture of Banana cv. Nendran.

S. No.	Ethylene absorbent blocks and size	Skin Colour	Texture
1.	Talc – 5 g	3.33	3.16
2.	Talc – 10g	3.33	3.16
3.	Talc – 20g	3.00	3.06
4.	Kaolin – 5 g	3.33	3.00
5.	Kaolin – 10g	3.16	3.00
6.	Kaolin – 20g	3.66	3.16
7.	Control	3.33	4.13
	S.Ed.	0.43	0.16
	C. D.	0.89	0.33
	F-test	S	S

Table 4: Effect of ethylene absorbent (Talc and kaolin) on sensory of Banana CV. Nendran.

S. No.	Ethylene absorbent blocks and size	Flavour	Taste	Overall acceptability
1.	Talc – 5 g	3.66	3.40	3.66
2.	Talc – 10g	4.50	5.30	4.16
3.	Talc – 20g	3.33	4.16	3.50
4.	Kaolin – 5 g	3.70	4.23	4.23
5.	Kaolin – 10g	3.66	3.73	3.83
6.	Kaolin – 20g	3.66	3.43	3.66
7.	Control	3.16	3.86	3.66
	S.Ed.	0.31	0.32	0.21
	C. D.	0.66	0.67	0.45
	F-test	S	S	S

Conclusion

From the present study it is concluded that kmno4 (ethylene absorbent) with both 20 g block size of carrier materials Talc and Kaolin shows best result for enhancing shelflife of Nendran banana.

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