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SHELF LIFE OF BER (*ZIZIPHUS MAURITIANA* LAMK.) AS AFFECTED BY POSTHARVEST TREATMENTS AND STORAGE ENVIRONMENT.

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ABSTRACT

Under arid agroecosystem, ber (Z. *mauritiana* Lamk.) not only provides sustainable production but also produces nutritious fruits rich in carbohydrates, vitamins and minerals. Owing to nonclimacteric development, *ber* fruits are harvested at full ripening. As a consequence and owing to delicate skin, prone to external factors, their duration of storage is very short. The fruits loss colour and pulp firmness within a short time. In order to improve the shelf life of *ber* fruits, effect of 12 treatment combinations were studied. The data on physiological and pathological losses and change in colour were monitored at three days interval under ambient (28 ± 2°c and cool temperature (7±1°c). Under ambient conditions, *ber* fruits showed high degree of pathological infestation and loss in colour and could be stored only for 9 days, Whereas, under low temperature these could be stored upto 15 days beyond which the fruits lost their original colour to render them unacceptable. Treatment with 0.1% bavistin and 5% virosil agro reduced both pathological and physiological losses. Treatment with 1% calcium nitrate reduced the physiological loss in weight.

INTRODUCTION

Ber (Ziziphus mauritiana Lamk.) is an important arid fruit which produces nutritious fruits even under extremes of soil and climatic conditions prevailing in the region. Fruits are rich in carbohydrates, vitamins and minerals. Owing to wider adoptibility, *ber* plantations are coming up in remote and comparatively under developed areas. Being a non climacteric fruit, *ber* is harvested at full ripening. Riped fruits are highly perishable due to thin and delicate skin and high water content in the puls which reduces the shelf life of fruit after harvest. Due to rapid change in fruit colour and poor keeping quality it is very difficult to transport the fruits even from the site of production to the market. At present, *ber* does not have any organised marketing setup which leads to market glut during peak supply period and thus, the producer bound to sell their produce at a low price.

Regulating the supply of fruits in the market can be an effective mode under such circumstances which can be achieved either by selecting early, medium and late cultivars or by storing the fruits for certain period and then release of the produce as per price trend in the market. To store the *ber* fruits for longer duration an attempt has been made to improve the shelf life of fruits by some physical and chemical treatments under ambient and cool temperature conditions at Post harvest technology laboratory of National Research Centre for Arid Horticulture, Bikaner.

MATERIALS AND METHODS

Ripened fruits of *ber* cultivar Gola were treated with four physical [cool water (10°c) for 15 and 30 minutes and hot water (50°c) for 5 and 10 minutes] and seven chemical [Calcium chloride 0.5 and 1.0 per cent, virosil (H_2O_2) 2.5 and 5.0 per cent, calcium nitrate 0.5 and 1.0 per cent and bavistin 0.1 per cent] treatments alongwith an untreated control under completely randomised block design with three replications. Treated fruits were packed into perforated polythene bags (40x23 cm size with 8-10 holes/bags) and kept under ambient (28 ± 2°c) as well as under cool (7 ± 1°C) temperature conditions. Physiological loss in weight, pathological loss and colour change were monitored at three days interval using standard methods. Data were statistically analysed on computer.

RESULTS AND DISCUSSION

Physiological Loss in weight

Per cent physiological loss in weight (PLW) was increasing with the increase of storage period. It was noticed more under room temperature than under cool temperature conditions. Bavistin, calcium nitrate and virosil were effective in reducing the PLW at ambient temperature (Table 1). The PLW in control treatment was observed 8.1 per cent after 9 days of storage at ambient temperature. Minimum values (5.8) were recorded in fruits treated with bavistin (0.1%) where as treatment with cold water 30 minutes and hot water 5 minutes recorded the maximum PLW. Physiological loss after treatment with calcium nitrate (0.5 and 1.0%), virosil (5.0%) and hot water (10 minutes) were comparable. Similarly the treatments with calcium chloride 0.5 and 1.0 per cent and virosil 2.5 per cent were nearly identical after 9 days of storage. Calcium nitrate as post harvest treatment has reported to reduce the PLW by maintaining flesh firmness and retarding the rate of

Table 1 : Physiological loss in weight (%) during storage of treated ber (cv. Gola) fruits at ambient temperature

Treatment		Days after storage		
		3	6	9
Cool water (10°C)	15 minutes	1.7	4.4	6.9
Cool water (10°C)	30 minutes	2.7	6.3	9.8
Hot water (50°C)	5 minutes	2.9	6.4	9.3
Hot water (50°C)	10 minutes	2.1	4.0	6.7
Calcium chloride	0.5%	2.1	4.9	7.6
Calcium chloride	1.0%	2.0	4.6	7.3
Virosil (H_2O_2)	2.5%	2.1	5.0	7.7
Virosil (H_2O_2)	5.0%	1.8	4.1	6.6
Calcium nitrate	0.5%	1.1	3.8	6.7
Calcium nitrate	1.0%	1.6	4.0	6.3
Bavistin	0.1%	1.4	3.8	5.8
Control	no treatment	2.1	5.4	8.1
F Value		2.68	3.75	3.63
P Value		0.02	0.003	0.003

transpiration and respiration through fruit surface in apple (Scott and Wills, 1975), grape (Gupta *et al.*, 1980), guava (Singh *et al.*, 1981 and Singh, 1987) and in aonla (Vishal Nath *et al.*, 1992). $CaCl_2$ (1%) has been reported to reduce the weight loss of Gola fruits however in our study the effect of said chemical was not found effective in improving the shelf life.

At cool temperature, PLW was very low even after 15 days of storage. Calcium nitrate (0.5% noticed the minimum weight loss (Table 2). Statistical analysis of the data does not show any significant difference between treatments ($p = 0.07$). Identical results have also been reported in litchi under cool (8 ± 1°c) temperature conditions (Anon, 1998).

Table 2 : Physiological loss in weight (%) during storage of treated ber (cv. Gola) fruits at cool temperature

Treatment		Days after storage				
		3	6	9	12	15
Cool water (10°C)	15 minutes	0.0	0.8	1.6	2.4	3.5
Cool water (10°C)	30 minutes	0.5	1.8	2.8	3.3	4.4
Hot water (50°C)	5 minutes	0.3	1.0	1.7	4.0	3.2
Hot water (50°C)	10 minutes	0.2	1.4	2.1	3.0	3.9
Calcium chloride	0.5%	0.6	1.6	2.4	3.1	4.1
Calcium chloride	1.0%	0.4	1.1	1.8	2.3	3.1
Virosil (H_2O_2)	2.5%	0.5	1.9	2.9	3.7	4.7
Virosil (H_2O_2)	5.0%	0.2	1.7	2.7	3.2	3.9
Calcium nitrate	0.5%	0.1	1.0	1.7	2.0	2.4
Calcium nitrate	1.0%	0.1	1.0	1.7	2.8	3.8
Bavistin	0.1%	0.5	1.2	2.0	2.6	3.4
Control	no treatment	0.2	1.3	2.0	2.8	3.7
F Value		1.53	2.15	2.06	0.65	2.01
P Value		0.18	0.05	0.06	-	0.07

Pathological Loss

After 9 days at ambient temperature storage, the pathological loss was to the tune of 67 per cent in control. Treatment with bavistin (a potent fungicide) reduced the pathological loss upto 10.6 per cent (Fig. 1). Among the other treatments tried, virosil 2.5 and 5.0 per cent and hot water for 10 minutes also reduced the pathological loss to less than 30 per cent after 9 days of storage. Post harvest treatment with fungicides such as borax (4%) in aonla (Vishal Nath *et al.*, 1992) and $KMnO_4$ (0.1%) in ber (Siddiqui and Gupta, 1989) and carbandazim (0.1% in mango (Anon. 1998) has also been found effective in controlling the pathological loss. Under cool temperature storage, no pathological loss was noticed even upto 15 days of storage. Similar results have also reported in litchi (Anon. 1998) under cool temperature conditions.

Colour Change

Calcium nitrate (0.5%) recorded the minimum colour change (13%) followed by bavistin (0.1%) and virosil (2.5%) after 9 days of storage under ambient temperature (Fig. 1). Calcium chloride 1.0

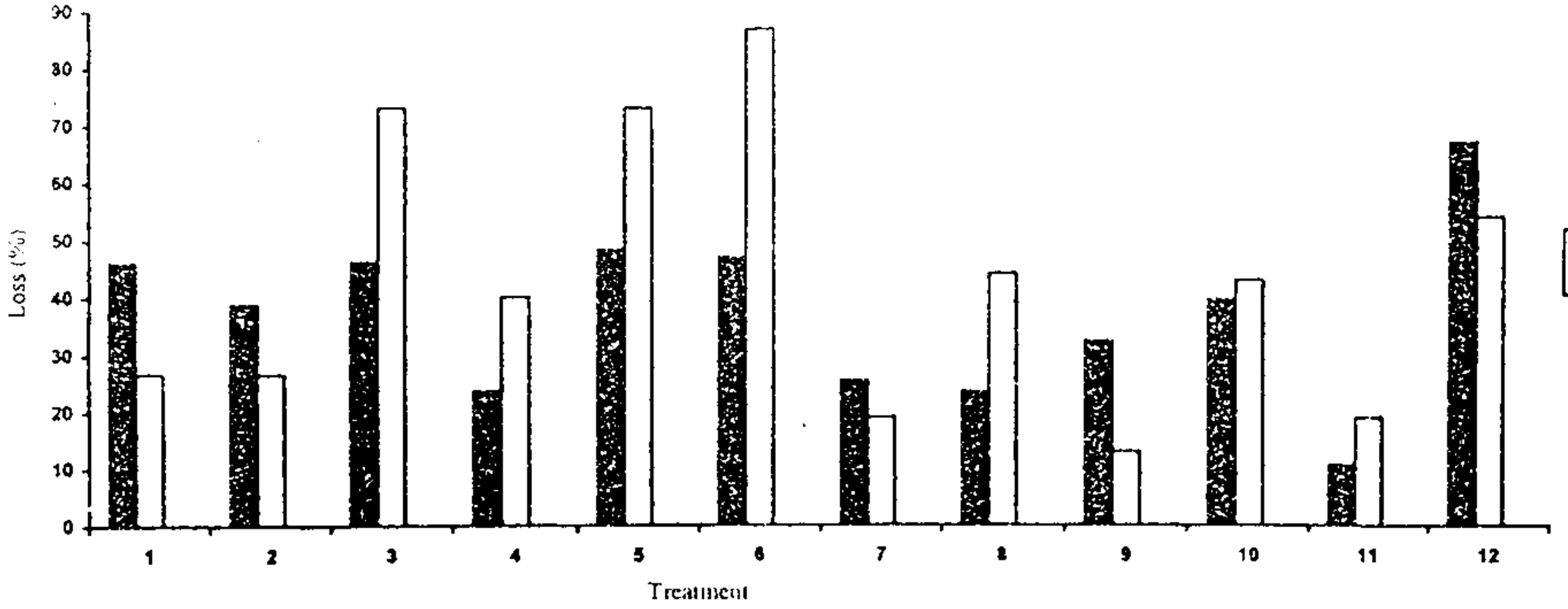

Fig.1 : Per cent pathological loss and colour change after 9 days of storage of *ber* fruits at ambient temperature

per cent and 0.5 per cent and hot water treatment for 5 minutes recorded the maximum colour change ranged from 73.0-86.7 per cent. However, under cool temperature storage no colour change was noticed even upto 15 days of storage.

CHANGES IN FRUITS AFTER WITHDRAWAL FROM COOL TEMPERATURE

There is a time lag between the withdrawal of fruits from the cool store to its consumption. In order to find out the time period upto which the fruits remain acceptable, the study was undertaken. The observations recorded at first day of shifting reveals no pathological loss in any of the treatment except control. Even the colour change was not recorded in treatments like calcium nitrate 0.5 per cent, virosil 2.5 per cent and cool water for 15 minutes. In all the other treatments, the colour change was less than 20 per cent (Table 3). At third day of shifting, the pathological loss was minimum 9.7% in bavistin (0.1%). The treatments with calcium nitrate 0.5 and 1.0 per cent and virosil 2.5 and 5.0 per cent and hot water treatment for 10 minutes were also effective in controlling the pathological loss whereas other treatments were not able to maintain the colour upto acceptable limit (Table 3). Therefore, from this study, it can be argued that *ber* fruits should be disposed off within 48 hours after withdrawal from cool storage.

Table 3 : Effect of treatments on pathological loss and colour change in fruits shifted at ambient temperature from cool temperature

Treatment		Days of shifting to ambient temperature			
		1st		3rd	
		Pathological loss (%)	Colour change (%)	Pathological loss (%)	Colour change (%)
Cool water (10°C)	15 minutes	0.0	00.0	30.2	60.0
Cool water (10°C)	30 minutes	0.0	10.0	32.5	63.0
Hot water (50°C)	5 minutes	0.0	13.0	35.0	86.7
Hot water (50°C)	10 minutes	0.0	12.5	13.0	66.6
Calcium chloride	0.5%	0.0	14.0	25.0	86.7
Calcium chloride	1.0%	0.0	20.0	25.0	100.0
Virosil (H_2O_2)	2.5%	0.0	00.0	14.0	54.0
Virosil (H_2O_2)	5.0%	0.0	14.5	12.0	75.0
Calcium nitrate	0.5%	0.0	00.0	15.0	36.7
Calcium nitrate	1.0%	0.0	18.0	18.2	80.0
Bavistin	0.1%	0.0	15.0	9.7	77.0
Control	no treatment	5.5	10.0	40.0	61.0

Therefore, it can be concluded that the Post harvest treatment of bavistin (0.1%), virosil (2.5 and 5.0 per cent) and calcium nitrate (1.0 per cent) have potential to improve the shelf life of ber fruits at ambient temperature storage. *Ber* fruits can be stored at cool temperature upto 15 days provided the time lag between withdrawal of fruits from cool store and its supply to consumer should not exceed 48 hours.

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