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Effect of cycocel, potassium sulphate and benlate on fruit quality and organoleptic quality in ber (*Ziziphus mauritiana*) cv. BANARASI KARAKA

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ABSTRACT : Present paper throws light on the effect of three chemicals *viz.*, cycocel, potassium sulphate, and benlate on various fruit quality parameters and organoleptic quality on post harvest life of Ber, cultivar Banarasi Karaka was selected for the experiment. Foliar application of various treatments that is cycocel (0, 1000 and 1500 ppm), potassium sulphate (0, 1 % and 2%), and benlate (0 and500 ppm) to runoff stage. Frist application was given in month of September during blooming period followed by second application of pea stage of fruits. Experiment was laid out in Randomized Block Design with three replications. Uniform cultural practices were followed during course of investigation. Higher concentration of cycocel (1500ppm), potassium sulphate (2%) and benlate (500ppm) significantly increased fruit quality (reducing sugar and non-reducing sugar) during both year of experiment. Maximum reducing sugar was found with treatment combination c2k2b1 at 4 days storage period. These concentrations slightly increased the non-reducing sugar at 4 days storage period and organoleptic rating was found best under c2k2b1 treatment at 4 days storage stage. In general cycocel, potassium sulphate and benlate with higher concentration were found beneficial than control untreated fruits.

KEY WORDS : Cycocel, Potassium sulphate, Benlate, Ber

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Ber or Indian jujube (*Ziziphus mauritiana* Lamk.) is indigenous to India. The fruits are rich in vitamin C, vitamin A and vitamin B complex. The composition of fruits varies in different varieties. Leading Ber growing states in India are Haryana, Punjab, Uttar Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Bihar, Maharashtra, Andhra Pradesh and Tamilanadu. It is well documented in ancient literature in India and grown widely at commercial scale. A lot of work on nutritional and hormonal aspect has been done on several fruit crops, whereas information on these aspects in ber is scanty. Hence, present experiment was undertaking to find out the influence of cycocel, potassium sulphate and benlate on fruit quality parameters organoleptic quality during storage in ber.

RESEARCH METHODS

A field experiment was carried out to see the response of potassium sulphate, cycocel and benlate on fruit quality and organoleptic rating in ber (*Ziziphus mauritiana*) cv. BANARASI KARAKA. Treatments consisted of various concentrations of cycocel (0, 1000 and 1500 ppm), potassium sulphate (0, 1 and 2%) and benlate (0, 500 ppm). Experiment was carried out in Randomized block design with three replications. Distilled water was used to prepare the solution. Different concentration of chemicals were sprayed to the ber plants at flowering and pea size stage. Control plants were treated with distilled water. All chemicals and distilled water were applied to the plant up to runoff stage. Fruit quality (reducing sugar and non-reducing sugar) parameter taken at different days of storage was observed in the laboratory after harvesting of the fruits. Reducing and non-reducing sugar were determined by the methods described by Rangana (1977). The organoleptic quality were evaluated organoleptically by a panel of five judges who scored on nine point hedonic scale given by Amerih

et al. (1965). Score below 6 was considered as poor in quality.

RESEARCH FINDINGS AND DISCUSSION

Significant effect of various concentration of cycocel, potassium sulphate and benlate was observed Reducing sugar after harvesting at different storage period in ber fruit shown in (Table 1).The treatment combination $C_2K_2B_1$ was found maximum reducing sugar level with (10.28 and 10.30) at 4 days storage period with the mean of (8.91and 8.94). During both years of experiment. In storage period of reducing sugar increases up to 4 days and then consistently decrease with further advancement in storage period. The initial increase in reducing sugar up to 4 days is probably due to water loss in fruit and conversion of starch in sugar. Stahl and Camp (1971). Also approved that the certain cell wall material such as pectin and hemicelluloses might have been converted in to reducing substances during storage fruits. The decreasing in reducing sugar with further advancement in storage may be due to its faster utilization in respiration when the deteriorating process like sensescence, pathogen invasion at their peak. Potassium sulphate minimized the respiration rate by promoting development of thicker, outer wall and epidermal cells. Mengal and Kirkby (1978) and benlate reduce the incidence of pathogen by this way check the degradation reducing sugar these findings are aggrieved with Khalon and Dhillon (1980), Kumar *et al.* (1990) in graps and Nanayakkara *et al.* (1997) in apple.

Non-reducing sugar content of ber fruits significantly influence by application of chemical with different concentration on ber fruit was observed after harvesting at different storage period.shown in (Table 2). Maximum non-reducing sugar after harvesting of fruits (0 days to 12 days storage) was recorded with $C_2K_2B_1$(1500 ppm, 2 % and 500 pmm) (3.67 to 3.71) at 4days storage period. Which was significantly to untreated fruits. The trends of data during I year and II year of experiment. The initial increasing in non-reducing sugar content is due to hydrolysis and dehydration. The decreases in non-reducing sugar with further advancement in storage may be due to faster utilization in respiration and their conversion of starch in to sugar, similar findings have been reported by Kozanova (1963) and Kahlon and Dhillon (1980) in grapes.

Data pertaining to the organoleptic quality was significantly influenced by treatment from 0 days to 12 days of storage period shown in (Table 3). Marketable organoleptic rating value was found under the treatment combination

Table 1 : Effect of combinations of different levels of cycocel, potassium sulphate, benlate and storage periods on reducing sugar content of ber fruit cv. BANARASI KARAKA during storage

Treatments	Reducing sugar content									
	I year					II year				
	Storage period days					Storage period days				
	0	4	8	12	Mean	0	4	8	12	Mean
$C_0K_0B_0$	7.55	7.67	5.51	4.39	6.28	7.66	7.83	5.50	4.33	6.33
$C_0K_0B_1$	7.63	7.71	6.61	5.46	6.85	7.75	7.85	6.59	5.42	6.90
$C_0K_1B_0$	9.52	9.88	7.98	6.98	8.59	9.63	9.96	8.10	7.11	8.70
$C_0K_1B_1$	9.59	9.90	8.00	6.98	8.62	9.72	9.92	8.14	7.15	8.73
$C_0K_2B_0$	9.98	10.00	8.08	7.10	8.79	9.72	10.15	8.30	7.45	8.90
$C_0K_2B_1$	9.53	9.86	8.12	7.28	8.70	9.68	9.94	8.22	7.42	8.81
$C_1K_0B_0$	9.26	9.61	8.06	7.14	8.52	9.39	9.73	8.15	5.29	8.14
$C_1K_0B_1$	9.30	9.69	8.08	7.19	8.57	9.43	9.85	8.18	5.36	8.20
$C_1K_1B_0$	9.38	9.81	8.10	7.09	8.60	9.53	9.94	8.18	7.15	8.70
$C_1K_1B_1$	9.44	9.85	8.14	7.12	8.64	9.57	10.01	8.20	7.21	8.75
$C_1K_2B_0$	9.49	9.89	8.12	7.24	8.69	9.62	10.05	8.22	7.37	8.82
$C_1K_2B_1$	8.36	10.18	8.12	7.12	8.44	8.30	10.26	8.14	7.26	8.49
$C_2K_0B_0$	9.35	9.70	8.14	7.21	8.60	9.49	9.83	8.23	5.35	8.22
$C_2K_0B_1$	9.40	9.79	8.16	7.26	8.65	9.53	9.95	8.26	5.41	8.29
$C_2K_1B_0$	9.48	9.91	8.18	7.16	8.68	9.62	10.04	8.26	7.22	8.79
$C_2K_1B_1$	9.53	9.95	8.22	7.19	8.72	9.66	10.11	8.28	7.28	8.83
$C_2K_2B_0$	9.58	9.99	8.20	7.31	8.77	10.02	9.96	8.18	7.21	8.84
$C_2K_2B_1$	9.95	10.28	8.20	7.19	8.91	9.89	10.30	8.22	7.33	8.94
Mean	9.24	9.65	7.89	6.91		9.35	9.76	7.96	6.57	
C.D. (P=0.05)	Treatment	=			0.24					0.24
	Days	=			0.10					0.10
	Treatment x Days =				0.48					0.48

Table 2 : Effect of combinations of different levels of cycocel, potassium sulphate, benlate and storage periods on non reducing sugar content of ber fruit cv. BANARASI KARAKA during storage

Treatments	Non reducing sugar content									
	I year					II year				
	Storage period days					Storage period days				
	0	4	8	12	Mean	0	4	8	12	Mean
$C_0K_0B_0$	3.37	3.42	2.45	1.94	2.79	3.39	3.46	2.56	2.09	2.88
$C_0K_0B_1$	3.41	3.47	2.49	1.96	2.83	3.45	3.48	2.64	2.10	2.92
$C_0K_1B_0$	3.46	3.57	2.88	2.50	3.10	3.52	3.56	2.94	2.52	3.14
$C_0K_1B_1$	3.49	3.61	2.92	2.55	3.14	3.58	3.64	2.95	2.52	3.17
$C_0K_2B_0$	3.57	3.67	2.96	2.75	3.24	3.61	3.73	2.99	2.76	3.27
$C_0K_2B_1$	3.65	3.76	3.07	2.82	3.32	3.66	3.85	3.20	2.84	3.39
$C_1K_0B_0$	3.47	3.62	3.06	2.86	3.25	3.50	3.68	3.12	2.89	3.30
$C_1K_0B_1$	3.51	3.67	3.11	2.91	3.30	3.51	3.70	3.17	2.89	3.32
$C_1K_1B_0$	3.49	3.69	3.15	2.92	3.31	3.51	3.74	3.20	2.99	3.36
$C_1K_1B_1$	3.53	3.72	3.18	2.96	3.35	3.55	3.74	3.27	3.02	3.39
$C_1K_2B_0$	3.52	3.75	3.16	2.92	3.34	3.53	3.78	3.21	2.91	3.36
$C_1K_2B_1$	3.61	3.72	3.04	2.79	3.29	3.63	3.81	3.17	2.81	3.36
$C_2K_0B_0$	3.50	3.66	3.09	2.88	3.28	3.54	3.71	3.15	2.92	3.33
$C_2K_0B_1$	3.54	3.71	3.14	2.94	3.33	3.55	3.73	3.20	2.92	3.35
$C_2K_1B_0$	3.52	3.73	3.18	2.95	3.35	3.55	3.78	3.24	3.02	3.39
$C_2K_1B_1$	3.56	3.76	3.21	2.99	3.38	3.59	3.78	3.30	3.05	3.43
$C_2K_2B_0$	3.55	3.79	3.19	2.95	3.37	3.57	3.82	3.25	2.94	3.39
$C_2K_2B_1$	3.57	3.79	3.18	3.01	3.39	3.63	3.83	3.23	3.05	3.44
Mean	3.52	3.67	3.03	2.75		3.55	3.71	3.10	2.79	
C.D. (P=0.05)	Treatment	=			0.09					0.09
	Days	=			0.04					0.04
	Treatment x Days	=			0.18					0.19

Table 3 : Effect of combinations of different levels of cycocel, potassium sulphate, benlate and storage periods on organoleptic rating of ber fruit cv. BANARASI KARAKA during storage

Treatments	Organoleptic rating							
	I year				II year			
	Storage period days				Storage period days			
	4	8	12	Mean	4	8	12	Mean
$C_0K_0B_0$	5.97	3.90	1.06	3.64	6.08	4.13	1.09	3.77
$C_0K_0B_1$	6.36	5.93	4.92	5.74	6.54	6.03	5.06	5.87
$C_0K_1B_0$	7.26	6.30	5.22	6.26	7.36	6.30	5.41	6.36
$C_0K_1B_1$	7.98	7.15	5.93	7.02	8.14	7.40	6.08	7.20
$C_0K_2B_0$	6.13	5.83	4.77	5.58	6.13	5.78	4.89	5.60
$C_0K_2B_1$	6.96	6.23	5.34	6.18	7.21	6.46	5.46	6.38
$C_1K_0B_0$	7.76	7.06	5.51	6.78	7.99	7.52	5.65	7.06
$C_1K_0B_1$	6.96	6.49	5.31	6.25	7.10	6.63	5.54	6.42
$C_1K_1B_0$	7.11	6.43	5.19	6.24	7.20	6.57	5.25	6.34
$C_1K_1B_1$	6.53	6.13	5.15	5.94	6.74	6.31	5.28	6.11
$C_1K_2B_0$	7.04	6.36	5.14	6.18	8.25	7.54	6.12	7.30
$C_1K_2B_1$	7.96	7.41	5.97	7.11	8.33	7.61	6.18	7.38
$C_2K_0B_0$	7.84	7.13	5.56	6.84	8.07	7.59	5.71	7.13
$C_2K_0B_1$	7.03	6.55	5.37	6.32	7.17	6.70	5.60	6.49
$C_2K_1B_0$	8.04	7.48	6.03	7.18	8.37	7.91	5.78	7.35
$C_2K_1B_1$	6.59	6.19	5.20	6.00	6.80	6.38	5.34	6.17
$C_2K_2B_0$	8.21	7.76	5.63	7.20	8.33	7.61	6.18	7.38
$C_2K_2B_1$	8.29	7.84	5.69	7.27	8.46	7.99	5.84	7.43
Mean	7.22	6.57	5.17		7.39	6.74	5.30	
C.D. (P=0.05)	Treatment	=		0.21				0.22
	Days	=		0.09				0.09
	Treatment x Days	=		0.37				0.37

C2K2B1 (1500 ppm, 2 % and 500 ppm) (8.29 to 8.46), $C_2K_2B_0$ (1500 ppm, 2 % and 0 ppm) and C1K2B1 (1000 ppm, 2 % and 500 ppm) increasing organoleptic rating up to 4days storage period and after 4days to 12days decrease organoleptic rating. The maximum organoleptic rating was recorded with the fruits treated by $C_2K_2B_1$) treatment combination. Similar trend of organoleptic rating was found during I year II year of study. The taste of treated fruits was better than untreated fruits during the storage period, However organoleptic rating was decreased with advancement of storage period. The better storage life due slow degradation of chemical composition of fruits during storage and thereby maintained the quality. The marketability of fruits was also improved by treating with cycocel 1000 ppm and benlate 500 ppm alone or in combination. Benlate is systemic fungicide and, therefore, create a situation unfavorable for invasion of pathogen to fruits and thus the maintains marketability of the stored fruits. In early stage the treatment slowed down the metabolic degradation, delayed starch hydrolysis, retarded respiration and enzymatic activity. Desai and Deshpande (1978 b). says that the extended storage life of fruits with the application of cycocel and benlate has also been reported by Tandan *et al.* (1984) in guava and Kumar and Chharia (1990) in grapes.

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