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Storage behaviour of betelvine (*Piper betle* L.)

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ABSTRACT

To study the storability of betelvine cultivars in West Bengal condition an experiment was conducted in an established boroj during December 2012 to November 2013. Storage behaviour of different betelvine cultivars was greatly influenced by temperature and relative humidity of the boroj. The experiment was designed in Completely Randomized Design with fourteen treatments and five replications. CARI-2 showed In rainy season the lowest percentage (30.99 %) of storability was recorded in Chamundai Bhabna and highest percentage (57.37 %) was found in storability of leaves was recorded 90% and 19.64% after 5 days and 21 days of harvesting respectively during winter season and 73.36% and 2.87% during rainy season when depetiolated betel leaves were stored in bamboo basket with green banana leaves in room condition.

Keywords **:** Betelvine, season, storage.

Betelvine, commonly known as "Pan" (*Piper betle* L.), is an important cash crop, commonly used as chewing stimulant. It is cultivated in an area of about 55000 ha in India with an annual turnover of worth Rs. 9000 million providing livelihood to millions of people (Guha, 2006). West Bengal produces 13948600 *mote* betel leaves annually and earns Rs.100 crores approximately (Choudhury, 2006). Due to its various uses, it really stands alone without any parallel even today (Guha, 1997, Mehrotra, 1981). There are about 100 cultivars of betel vine in the world, of which about 40 are found in India and 30 in West Bengal (Maity, 1989 and Samanta, 1994).

Established boroj is choosen as an experimental site. Size of boroj was 10 ×12.5m. Water management is an important part for photosynthesis, stomatal opening, growth and expansion of leaf (Acharya *et al*., 2013). Various climatic factors like temperature, relative humidity and canopy temperature play an important role on storage life of betelvine leaves.

Lack of information, high labour cost and low producer price are the constaints of betelvine cultivation, (Suranse and Bhople, 2004) but it is a perennial source of employment (Prasad and Prasad, 2003). As leaf is the economic part of betelvine, the present study was conducted to identify the most suitable season for safe storage of betel leaf.

MATERIALS AND METHOD

The field experiment was conducted at Horticultural Research Station, Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia, West Bengal from December 2012 to November 2013. Fifteen cultivars like Bagerhat, Boinchigodi, Simurali Bhabna, Jabalpur, Ghanagette, Halisahar Sanchi, Simurali Jhal, Simurali Deshi, Kadwa, Simurali Goal Bhabna, CARI-2, CARI-6, Simurali Sanchi, Kalipatti, Chamundai Bhabna cultivars were considered as treatments. The experiment was laid out in Completely Randomised Design with five replications. During the experimental period, storability of different cultivars in different seasons was recorded.

To maintain the uniformity in the age of betelleaf, fresh, green and matured leaves were harvested from 8th node of vine from the top (Saikia *et al*., 1993). Leaves were depetiolated and stored when stored in bamboo basket lined with green banana leaves in different seasons. Petioles of the leaves were removed to avoid moisture loss and to increase storability of the leaves. After that 100 leaves from each cultivar were taken. The leaves were washed with distilled water and blotted to dry. The petioles of leaves were removed carefully with a sharp scissors from the base of the leaf lamina. Then the leaves were kept in bamboo basket lined with green banana leaves. The basket was covered with moist cloth and kept at room temperature. The percentage of shelf life of betel leaves or number of marketable leaves remained per 100 leaves was assessed at 4 days interval from 5 days after harvesting to 21 days after harvesting during four specific seasons of the year *i.e.,* Summer season (April - May), Rainy season (June - July), Spring season (September–October), Winter season (December–January).

The data obtained from each cultivar were analysed statistically by the analysis of variance method. The significance of different sources of variation was tested by error mean square by Fisher – Sendecors F test at probability levels of 0.05. For determination of Critical Difference (C.D) at 5 per cent level of

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significance, the statistical table formulated by Fisher and Yates (1979) was consulted.

RESULTS AND DISCUSSION

Senescence is an irreversible process in which disappearance of chlorophyll is treated as loss of quality in betel leaves with exception of deliberate bleaching. Among the various factors modifying senescence rate, low temperature was found to play a slowing down action on degradative enzymes and denaturation of macro molecules (Mishra and Gaur, 1980). The present findings as per meteorological data uphold the evidence of temperature and relative humidity effect on storage behaviour of betel leaves season wise.

Data represented in table 1, clearly indicated that percentage of shelf life in different cultivars of betel leaves, after depetiolation varied significantly among the cultivars in different seasons. The present investigation showed that betel leaves were proved to keep for longest days during winter season and the leaves rotted most quickly during rainy season (Table. 2). In winter season, CARI-2 exhibited highest percentage (57.37%) of storability and Simurali Jhal exhibited lowest percentage (51.19%) of storability (Table. 1) But in rainy season, Boinchigodi showed highest percentage (35.58%) of storability and Chamundai Bhabna showed lowest (30.99%) percentage of storability. In autumn season, highest percentage (44.77%) of shelf life was observed in Simurali Sanchi and lowest percentage (35.98%) was observed in Ghanagette. Presence of more humidity and slightly higher temperature in rainy season, causes fast degradation of chlorophyll and during winter season, due to less moisture in atmosphere keeping quality of the leaves were maximum. After depetiolation, when betel leaves were stored in bamboo basket with green banana leaves in room condition, storability of leaves was 90, 71.52, 54.13, 33.64 and 19.64 per cent after 5

Table 1: Percentage of shelf life in leaves of different cultivars of betelvine at different seasons.

Cultivars	Summer season	Rainy season	Autumn season	Winter season
	April – May	June - July	Sept - Oct	Nov - Dec
Bagerghat	47.00 (41.37)	36.80 (34.37)	46.30 (42.51)	57.16 (52.15)
Boinchigodi	46.96 (43.40)	38.42 (35.38)	45.28 (41.90)	58.16 (52.93)
Simurali Bhabna	45.46 (40.24)	37.00 (33.19)	43.88 (40.51)	57.78 (52.64)
Jabalpur	44.06 (40.81)	37.96 (33.86)	45.16 (41.55)	56.50 (51.76)
Ghanagette	41.92 (37.58)	36.18 (32.70)	39.62 (35.98)	55.90 (51.30)
Halisahar Sanchi	47.24 (42.94)	36.76 (34.42)	42.06 (39.15)	58.50 (53.12)
Simurali Jhal	46.46 (42.45)	34.94 (31.60)	43.00 (40.08)	55.76 (51.19)
Simurali Deshi	46.38 (42.10)	37.08 (34.21)	43.82 (40.54)	56.28 (51.59)
Kadwa	46.58 (41.28)	37.76 (34.88)	47.16 (43.80)	61.82 (55.40)
Simurali Goal Bhabna	44.98 (41.17)	38.04 (34.97)	45.60 (41.95)	63.24 (56.41)
CARI-2	45.00 (41.62)	36.72 (32.86)	47.12 (43.70)	64.44 (57.37)
CARI-6	42.96 (38.70)	36.76 (32.88)	47.96 (44.64)	62.88 (56.12)
Simurali Sanchi	41.98 (39.15)	36.10 (32.59)	48.58 (44.77)	63.34 (56.45)
Kalipatti	41.66 (37.87)	37.90 (34.90)	47.78 (44.06)	61.34 (54.93)
Chamundai Bhabna	40.40 (38.09)	34.16 (30.99)	45.40 (41.58)	59.04 (53.28)
SEm(±)	**1.16**	**0.74**	**0.59**	**0.81**
LSD(0.05)	**3.30**	**2.08**	**1.66**	**2.29**

days, 9, 13, 17 and 21 days of harvesting respectively during winter season and 73.36, 56.02, 27.20, 8.50 and 2.87 per cent during rainy season (Table. 2).

Number of marketable leaves remained per 100 leaves was highest 5 DAH followed by 9, 13, 17 and 21 DAH. In winter season, highest number of leaves (100) remained per 100 leaves was highest 5 DAH. In winter season, CARI 2 give highest number of marketable leaves 9 DAH followed by 13, 17 and 21 DAH (Table 3). Boinchigodi and Kadwa gave 96.6 marketable leaves per 100 leaves followed by Halisahar Sanchi and Simurali Sanchi (96.2).

Negi and Chaurasia (1996) reported that post harvest losses of betel leaves during storage was highest (54.6%) in June and lowest (27.2%) in January with an average (39.51%) loss throughout the year. According to Imam, (2008), packing of betel vines with banana leaves was found superior to wet straw packing. It might be due to low temperature in banana leaves and high temperature due to heat trapping by wet straw and creation of an adverse microclimate for more and quick losses. It was also observed that irrespective of season, petiole regulation, methods of storage, ascorbic acid, and chlorophyll content in leaves gradually decrease with increasing storage period. In an experiment, Pandey *et al*. (1998) also marked the changes in chlorophyll activity up to 30 days and noticed that all the qualitative parameters went down at storing.

In another experiment investigated by Saikia and Dutta (1993) on the storage life of leaves of five cultivars of betelvine, it was found that the most effective storage treatment was in banana leaves, while leaves from Local Bangla cultivar exhibited the longest storage life and healthy leaves after 14th days storage in banana leaves and exhibited the least spoilage. Negi and Chaurasia (1996) observed that the post harvest losses of betel leaves during storage was highest (54.6%) in June and lowest (27.2%) in January with an average (39.51%) loss throughout the year.

Table 2: Percentage of shelf life of betel vine leaves in overall cultivars.

DAH	Summer Season	Rainy Season	Autumn Season	Winter Season
	April – May	June - July	Sep - Oct	Dec - Jan
5	97.24 (80.54)	91.76 (73.36)	98.20 (82.62)	100.00 (90.00)
9	76.78 (61.27)	68.72 (56.02)	73.14 (58.81)	89.82 (71.52)
13	38.24 (38.16)	20.94 (27.20)	40.70 (39.61)	65.49 (54.13)
17	9.32 (17.66)	2.21 (8.50)	12.23 (20.29)	30.77 (33.64)
21	1.42 (5.29)	0.54 (2.87)	1.95 (7.58)	11.30 (19.59)
SEm(±)	**0.67**	**0.42**	**0.34**	**0.47**
LSD(0.05)	**1.90**	**1.20**	**0.96**	**1.32**

Note: DAH - Days after harvesting and figures in the parentheses are the transformed values

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Table 3: Number of marketable leaves remained/100 leaves of betel vine in different seasons

Cultivars	Days after harvest																			
	April–May					June–July					September-October					December-January				
	5	9	13	17	21	5	9	13	17	21	5	9	13	17	21	5	9	13	17	21
Bagerhat	97.2	82.9	43.7	11.2	0	95.3	65.4	22.2	3.1	1	98.5	73.7	43.3	14.6	1.4	100	86.4	61.2	61.2	11.4
Boinchigodi	98.4	78.3	41.6	13.1	3.4	96.6	71.4	23.6	2.5	1	98.8	71.3	42.3	12.6	1.4	100	88.9	62.4	62.4	12.1
Simurali Bhabna	96.7	77.7	41.4	11.5	0	95.7	69.8	21.3	2.2	0	97.6	70.4	38.6	11.7	1.1	100	88.4	60.3	60.3	11.3
Jabalpur	97.3	73.9	37.3	9.6	2.2	95.5	72.1	23.1	2.1	0	98.4	73.2	42.1	10.8	1.3	100	87.5	57.3	57.3	10.4
Ghanagette	95.5	72.1	34.2	7.8	0	93.4	65.9	19.8	1.8	0	95.8	68.7	27.8	5.8	0	100	87.2	56.7	56.7	9.3
Halisahar Sanchi	97.5	80.3	45.4	10.7	2.3	96.2	66.8	20.7	1.9	2.2	97.8	71.2	32.5	7.8	1	100	89.4	63.4	63.4	11.3
Simurali Jhal	97	81.2	41.3	10.2	2.6	94.1	64.3	18.6	1.7	0	98.8	70.4	36.5	8.3	1	100	87.5	56.7	56.7	8.8
Simurali Deshi	96.2	79.5	43.6	10.4	2.2	95.4	69.8	21.1	2.1	1	97.2	72.6	38.4	8.8	2.1	100	88.3	57.4	57.4	9.4
Kadwa	98	80.8	42.8	11.3	0	96.6	70.4	22.2	2.6	1	99.4	74.8	44.7	14.2	2.7	100	91.4	68.8	68.8	13.3
Simurali Goal Bhabna	96.3	78.3	38.9	9.3	2.1	95.8	71.3	24.3	2.8	1	96.7	73.3	41.3	14.1	2.6	100	92.5	73.2	73.2	13.8
CARI-2	98.2	77.3	38.2	9.1	2.2	95.2	70.6	19.9	1.9	0	98.9	74.1	43.7	15.6	3.3	100	94.3	75.4	75.4	14.3
CARI-6	97.8	75.4	33.8	7.8	0	94.6	71.1	20.1	2	0	99.6	75.3	45.6	15.9	3.4	100	92.4	73.2	73.2	12.6
Simurali Sanchi	96.7	72.7	31.6	6.7	2.2	96.2	68.5	17.6	2.2	0	99.2	77.6	46.2	16.7	3.2	100	93.2	74.8	74.8	11.8
Kalipatti	98.2	72.5	31.1	6.5	0	94.2	71.4	23.8	3.1	1	98.8	76.2	45.4	15.2	3.3	100	91.1	72.1	72.1	10.3
Chamundai Bhabna	97.6	68.8	28.8	4.7	2.1	91.7	62.1	15.8	1.2	0	97.6	74.3	42.2	11.4	1.5	100	88.8	69.4	69.4	9.4

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