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SHORT COMMUNICATION

"*Tikdi*" – A Fruit Fly Resistant Land Race of Ber (*Ziziphus mauritiana* Lamarck)

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"*Tikdi*"– a land race of ber collected from Rajasthan has shown strong resistance to fruit fly infestation, high tolerance to drought and resistance to frost and owing to these traits it is used as a root stock for other commercial varieties of ber. Its fruits are preferred by affluent people and sold at higher prices as fruits are free from larva of fruit fly and their excreta and dehydrated fruits can be stored for more than six months. The upright growth habit of tree of Tikdi enables it suitable for agro-forestry. Full grown up tree of Tikdi produce higher leaf fodder to feed livestock.

Key Words: Ber, Fruit fly, Genetic resources

The Indian *ber* (*Ziziphus mauritiana* L) and Chinese *ber* (*Ziziphus jujube* Mill) are two domesticated species, which are cultivated to vast areas of old world (Liu, 2006) and adapted to hot arid conditions. The *Ziziphus mauritiana* (L.) is cultivated on a wide range of soils from gravelly, shallow soils to deep aridisols and to some extent on entisols (Pareek, 1983). *Ber* trees can withstand high temperature and can be grown in regions reaching temperature of even upto 42°C. Although, ber tree can tolerate temperature as high as 50°C but, fruit set is adversely affected at temperature above 35°C.

Ber is considered to be multi-use tree and commonly used for live fencing and to control soil erosion. Due to the high dry weight protein content, leaves are an important feed source of protein for animals (Arndt and Kayser, 2001). Leaves of ber can be used to feed silkworms and lac insects; flower are a source of nector for honeybees.

The use of the fruits is the major focus of interest. The pulp of fruit is most important in relation to its nutritional value. The content of pulp in fruit is cultivar specific and ranges from 81 to 92% (Pareek, 1983). Ber is richer than apple in protein, phosphorus, calcium, carotene and vitamin C and oranges in phosphorus, iron, vitamin C and carbohydrates and exceeds them in calorific value. Ripe fruits provide 20.9 Kcalories per 100 g of pulp (Singh *et al.*, 1973). The amino acids, asparagine, aspartic acid, glycine, glutamic acid, serine and threonine are found in the pulp. Ber has been reported as an immune stimulant, anti-biotic, anti-nephritic, anti-ulcer, anti-diabetic, anti-inflammatory and anti-oxidant (Ali *et al*., 2006).

The productivity and quality of ber fruits are adversely affected by a number of insect pests like fruit fly, stone weevil, fruit borer, bark eating caterpillars and hairy caterpillars. The fruit fly (*Carpomyia vesuviana*), considered the most serious pest of ber has been observed to damage up to 80% of the crop under severe damage (Cherian and Sunderam, 1941). Although, these insects can be controlled by applying insecticides on the crop (Gyi *et al*., 2003), inbuilt genetic resistance offers better option to control the incidence of the insects. The infestation starts with the fruit setting. The adult female lays eggs singly by inserting its ovipositor in the young developing fruit. After 2 to 5 days the larvae hatch, start feeding on the pulp and make galleries in it. Generally, only one larva is found in one fruit. The excreta of the larva accumulates in the galleries, results in rotting of the fruit. Infested fruits become deformed and their growth becomes stunted. A large number of such fruits drop off. The larval stage lasts 9 to 12 days. Full grown (6 mm length) larva finds its way out by making a hole in the fruit skin and drops to the ground. The larva bores down into the soil upto the depth of 2 to 12 cm where

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it pupates and occasionally pupation takes place within infested fruits (Bagdavadze *et al*., 1977). The pupal period lasts about 2 weeks after which the adult fly (5 to 8 mm long and 3 mm broad) emerges. Pairing and oviposition occur during day light and at night, fly usually rests in the canopy and it completes two generations per year (Berdyeva, 1978).

At Jodhpur Regional Station of National Bureau of Plant Genetic Resources, the 57 live trees of wild, land races and cultivated varieties are maintained in the field genebank. A wide range of variation for vegetative, leaf, floral fruit and quality traits has been observed (un-published data). Traits specific pooled values of three replications over two years of some of the selected cultivars of ber has been recorded for fruit and seed characters (Table 1).

Data were recorded on infestation of fruit fly on the selected cultivars at the interval of 10 days in three trees during 2012-13 and 2013-14. In all cases, 10 randomly selected fruits were examined carefully for occurrence of hole in the fruits then all fruits were peeled, with knife, to confirm the stone and fruit fly damage and percentage of infested fruits was calculated. The TSS of these fruits was also recorded (Table 2 & 3).

From Table 2 & 3 it is evident that a large genetic variation is present among cultivars for fruit fly resistance and TSS concentration. "*Tikdi*" the land race of ber that had been collected and planted by Shri DP Chopra, Economic Botanist, at NBBPGR, Regional Station, Jodhpur, on 28.06.1968 had shown absolute resistance to fruit fly. It also appears from the table that concentration of TSS in the ber fruits is not having any impact on

Table 1. Pooled value of three trees for two years on selected cultivars for fruit and stone traits

Cultivar	Fruit Shape	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (gm)	Stone weight (gm)	Stone length (cm.)	Stone diameter (cm)	Pulp weight (gm)
Pemily	Oblong	3.38	2.54	12.24	0.89	2.16	0.92	11.35
Illaychi	Round	1.68	1.68	2.83	0.25	1.18	0.62	2.58
Tikdi	Long	1.94	1.40	1.90	0.32	1.72	0.92	1.47
Seb (hard)	Oblong	3.10	2.94	17.53	1.36	1.98	1.10	16.17
Seb (soft)	Round	2.60	2.36	7.77	0.73	1.70	0.98	7.04
Mundia	Long	3.30	2.36	9.71	0.78	2.26	0.88	8.93
Gola	Round	2.60	2.42	8.15	0.87	1.78	1.04	7.28
Gola (Kakwan)	Round	2.52	2.52	9.94	0.83	1.68	1.02	9.11
Aliganj	Round	2.68	2.10	6.69	0.83	1.74	0.98	5.86
Gola (Delhi)	Oblong	2.42	2.32	7.82	0.92	1.72	1.04	6.90
Umran	long	3.52	2.84	15.62	0.98	2.20	0.92	14.64

Table 2. Infestation (%) by fruit fly and TSS of fruits of selected cultivars during 2013-14

Cultivars	Dec. 30, 2014		Jan.10, 2014		Jan. 20, 2014		Jan 30, 2014		Feb.10, 2014	
	Inf. (%)	TSS	Inf. (%)	TSS	Inf. (%)	TSS	Inf. (%)	TSS	Inf. (%)	TSS
Gola	80	13.6	60	15.4	50	15.8	60	22.0	50	24.4
Gola (Delhi)	40	13.2	40	13.8	50	14.2	20	24.2	30	23.8
Gola (Kakwan)	90	17.0	80	19.0	60	19.6	40	21.0	60	23.2
Seb (soft)	60	15.0	60	15.0	40	17.0	10	17.4	20	19.8
Seb (Hard)	20	17.4	40	21.0	30	20.8	20	24.0	20	25.0
Pevandi	30	18.2	30	18.8	40	19.0	30	19.4	40	21.6
Umran	40	14.4	10	17.2	20	17.8	30	20.2	20	21.4
Aliganj	90	18.0	70	19.0	60	19.4	60	19.8	50	20.8
Pemily	50	14.0	20	14.0	30	15.4	60	18.4	40	20.2
Chhuhara	40	13.0	20	14.2	30	16.4	40	16.4	40	19.2
Tikdi	0	14.2	0	14.6	0	15.8	0	19.6	0	22.4
Mundia	50	13.8	30	14.0	40	14.2	20	14.6	30	16.8

Table 3. Infestation (%) by fruit fly and TSS of fruits of selected cultivars during 2012-13

Cultivars	Dec. 27, 2012		Jan.05, 2013		Jan. 16, 2013		Jan 28, 2013		Feb.06, 2013	
	Inf.(%)	TSS	Inf.(%)	TSS	Inf.(%)	TSS	Inf.(%)	TSS	Inf.(%)	TSS
Gola	60	14.5	70	16.6	50	16.0	60	22.6	60	25.3
Gola (Delhi)	50	13.9	60	14.3	60	15.4	30	24.5	30	23.5
Gola(Kakwan)	70	17.7	80	18.2	70	19.0	50	20.8	50	23.8
Seb (soft)	70	14.8	50	14.5	50	18.7	30	18.4	30	20.7
Seb(Hard)	40	16.2	50	22.0	30	22.1	40	24.7	20	24.8
Pevandi	50	18.6	30	19.3	30	19.6	40	18.3	30	22.1
Umran	60	15.1	30	17.8	30	18.7	20	20.0	10	21.9
Aliganj	100	16.9	80	18.5	50	19.0	50	18.8	60	22.0
Pemily	30	14.5	10	14.4	30	17.5	60	19.6	30	20.0
Chhuhara	40	12.5	40	15.8	30	17.6	40	17.6	50	18.9
Tikdi	0	15.1	0	14.9	0	16.8	0	18.9	0	23.0
Mundia	30	14.6	40	13.7	50	15.4	30	15.4	40	17.3

resistance or susceptibility for fruit fly. On the basis of experience and ITK information on selected cultivars for drought and frost tolerance, shelf life, taste etc. has been compiled (Table 4).

The fruits of *Tikdi* rarely contain insect larva and their excreta. Its shelf life is more than six months and can be dried and store even for longer time. Because of its better quality, fruits of *Tikdi* are sold at higher price than others. The grown plants of *Tikdi* are highly tolerant to drought and resistant to frost. Owing to these qualities it is used as a root stock for other commercial varieties of *ber*. Trees are vigorous with upright growth habit and have higher leaf fodder production potential

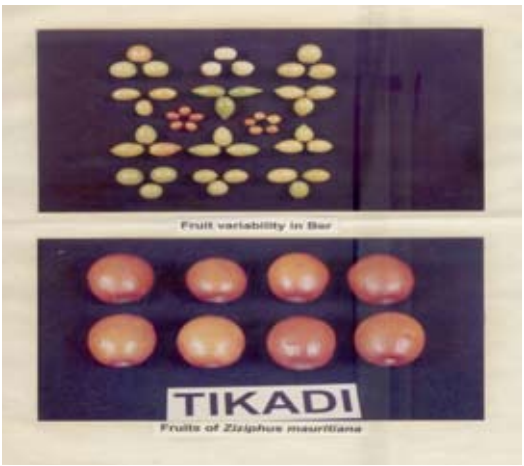

Fig. 1. Fruits of *Tikdi* land race of ber

Table 4. Useful traits of Tikdi on the basis of experience and ITK

Cultivars	Drought tolerance	Tolerance to frost	Used as root stock	Shelf life of fruit	Taste	Market Price of 2013-14 Rs./Kg
Gola	Moderate	Susceptible	No	3-5 days	Sweet	30-40
Gola (Delhi)	Moderate	Susceptible	No	3-5 days	Sweet	30-40
Gola (Kakwan)	Moderate	Susceptible	No	3-5 days	Sweet	30-50
Seb (soft)	Moderate	Susceptible	No	3-5 days	Sweet	40-50
Seb(Hard)	Moderate	Susceptible	No	5-7 days	Sweet	40-50
Pevandi	Moderate	Susceptible	No	3-5 days	Sweet	25-40
Umran	Moderate	Susceptible	No	5-10 days	Sweet	40-60
Aliganj	Moderate	Susceptible	No	3-5 days	Sweet	40-60
Pemily	Moderate	Susceptible	No	3-5 days	Sweet	20-40
Chhuhara	Moderate	Susceptible	No	3-5 days	Sweet	20-30
Tikdi	High	Resistant	Yes	6 months or more (dehydrated)	Sweet	60-80
Mundia	Moderate	Susceptible	No	3-5 days	Sweet	20-30

to feed livestock and camels. The upright growth habit of tree enables it for agro-forestry.

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