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RESEARCH ARTICLE

CHANGES IN PROTEIN CONTENT AND ACTIVITY OF ENZYME PROTEASE DURING DEVELOPMENT AND MATURITY IN BER FRUIT (*ZIZIPHUS MAURITIANA*, LAMK.) CVS. MEHRUN- KHEDI, MEHRUN AND M.P.K.V.

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ABSTRACT

The changes in protein content of fruit pulp were studied in ber cultivars Mehrun-Khedi, Mehrun and M.P.K.V. during development and maturity of fruits at regular interval of 20 days, from 20 days after fruit-set up to 120 days. The protein content of the Ber fruit pulp showed a sharp decline up to 40 days after fruit-set but thereafter the decrease in it was very fast in Mehrun- Khedi till maturity of fruits. At maturity, the protein content was comparatively more in M.P.K.V. Than Mehrun- Khedi and Mehrun cultivars. This decreases in protein content of fruit pulp during development and maturity of Ber fruits in all the three cultivars which may be attributed to hydrolysis of protein by increased activity of enzyme protease of the fruit pulp.

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INTRODUCTION

Ber (*Ziziphus mauritiana*, Lamk.) is one of the most ancient indigenous fruit of India. Its scattered cultivation all over India is ascribed to its hardy nature, ability to grow on poor soils and low cost of production. There are about 125 varieties of ber grown in different parts of India. Mehrun-Khedi and Mehrun are the famous varieties of Maharashtra, popularly grown in Jalgaon, Dhule and Nashik districts as these varietese are resistant to rotting by nymphs, better in taste and M.P.K.V. is a wild cultivar, locally cultivated in M.P.K.V. Rahuri. During development and maturity of fruit, it may undergo some characteristics physico-chemical changes. The studies on the changes in protein content during development and maturity in ber fruits have been made by various workers (Randhawa and Biswas, 1966, Sharma and Bawa, 1977; Bal et al., 1978; Gupta et al., 1983; Pandey et al., 1990; Al Niami et al., 1992; Fandi, 1999; Abbas et al., 2002; Li et al., 2007; Pareekh 2013; Meena 2014). The harvesting of fruits at right stage is of paramount importance to receive the higher premium from the produce. From the available literature it has been observed that the work on changes in protein content during development and

maturity has not reported in ber Cvs. Mehrun-Khedi, Mehrun and M.P.K.V. Therefore, in the present investigation attempts have been made to study the changes in protein content and the activity of enzyme protease during development and maturity at different developmental stages right from fruit setting to maturity in ber cultivars, Mehrun-Khedi and M.P.K.V.

MATERIALS AND METHODS

The present investigation on Ber (*Ziziphus Mauritiana* Lamk) Var. Mehrun-Khedi, Mehrun and M.P.K.V. was carried out during 2010-2011. Material used and method followed during the investigation are described in the succeeding paragraph.

A) Materials

- Five year old plants of ber cultivars Mehrun-Khedi, Mehrun and M.P.K.V. growing in the orchards of Mahatma Phule Agricultural University, Rahuri (M.S) were selected for the present investigation.
- The fruits of these Cvs, were collected at an interval of 20 days after fruit-set and continued till the complete ripening stage was reached.

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B) Methods

- The fruit samples were washed with distilled water and adhering impurities were removed before analysis.
- Soluble proteins from the fruit pulp of all these three cultivars were extracted and estimated using Folin-Ciocalteu reagent according to the method of Lowery et al. (1951). And the activity of enzyme protease was determined by measuring the amount of tyrosine liberated from the substrate (1% casein) as described by Penner and Ashton (1967).

RESULTS AND DISCUSSION

The data in respect of protein content and the activity of enzyme protease from the fruit pulp during development and maturity of fruits in all these three cultivars is depicted in Table 1 and Fig. 1,2. The data in respect of protein content of the fruit pulp in all the three cultivars showed a decreasing trend as the fruit advanced to maturity (Table 1) and Fig.1. The protein content of the fruit pulp showed a sharp decline upto 40 days after fruit set but thereafter, the decrease in it was very fast in Mehrun-Khedi and gradual in both Mehrun and M.P.K.V. Cultivars till maturity. However, the protein content of this indicate that, at maturity the protein content was maximum in M.P.K.V. followed by Mehrun-khedi and Mehrun. Bal et al. (1978) have studied the effect of fruit maturity on protein content in cultivars Umran and Sanaur-2 and concluded that the protein content followed a decreasing trend towards maturity.

Gupta et al. (1983), on other hand, reported that in cultivar Gola, there was marginal decrease in protein content up to 75 days after fruit set and later on it decreased sharply. Our results (Table 1, Fig.1) of decrease in protein content of fruit pulp during development and maturity of fruits in all the three cultivars studied are also in agreement with those of Bal et al. (1978), Gupta et al. (1983); Bhatia and Gupta (1985); Kadam et al. (1993); Sharma (1996); Pareekh, (2013).

The result of changes in protease activity of fruit pulp in all the three cultivars studied during development and maturity of fruits are presented in Table 1, Fig.2. The data in respect of protease activity showed a gradual increasing trend during development and maturity of fruits. In M.P.K.V. the activity increased gradually up to half maturity stage (60 days) and thereafter, slight increase in protease activity up to 100 days and sharp increase at maturity (120 days) was noted. In Mehrun- Khedi and Mehrun, the protease activity was more or less the same at half maturity stage (60 days) and thereafter, the slow and gradual increase in protease activity was noted in a Mehrun Khedi. At maturity, more protease activity was noted in Mehrun Khedi followed by Mehrun and M.P.K.V. This increased protease activity may be correlated with the reduced level of proteins during development and maturity of the ber fruits in all three cultivars of the present investigation. It also appears that, increase in protease activity possibly increases the free amino acids due to hydrolysis of proteins. Bal et al. (1979) reported increase in amount of amino acid during ripening of Umran Ber fruits. The increased protease activity might also be causing the tissue maceration by degrading the structural wall proteins as suggested by Ginzburg (1967) thereby causing softening of fruits.

Table 1. Changes in protein content and the activity of enzyme protease during development and maturity of ber fruits Cvs. Mehrun-Khedi, Mehrun and M.P.K.V.

Days after fruit-set	Mehrun-Khedi		Mehrun		M.P.K.V.	
	Protein(%)	Protease*	Protein(%)	Protease*	Protein(%)	Protease*
20	17.7	31.30	15.5	32.70	18.5	25.40
40	13.2	35.47	10.2	36.89	11.5	28.30
60	11.6	37.50	8.4	37.35	10.6	31.50
80	9.4	42.50	6.8	38.20	8.8	33.50
100	5.8	45.20	5.3	41.17	7.2	34.90
120	3.8	51.13	3.4	41.67	4.6	38.90

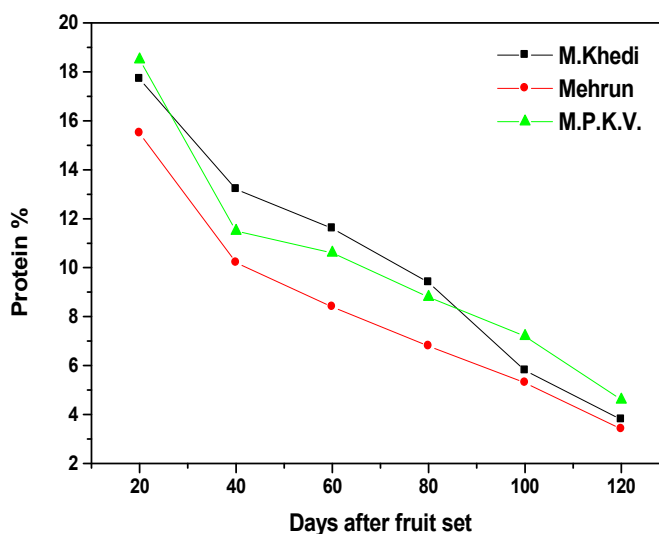


Fig.1. Changes in proteins during development and maturity of ber fruit.

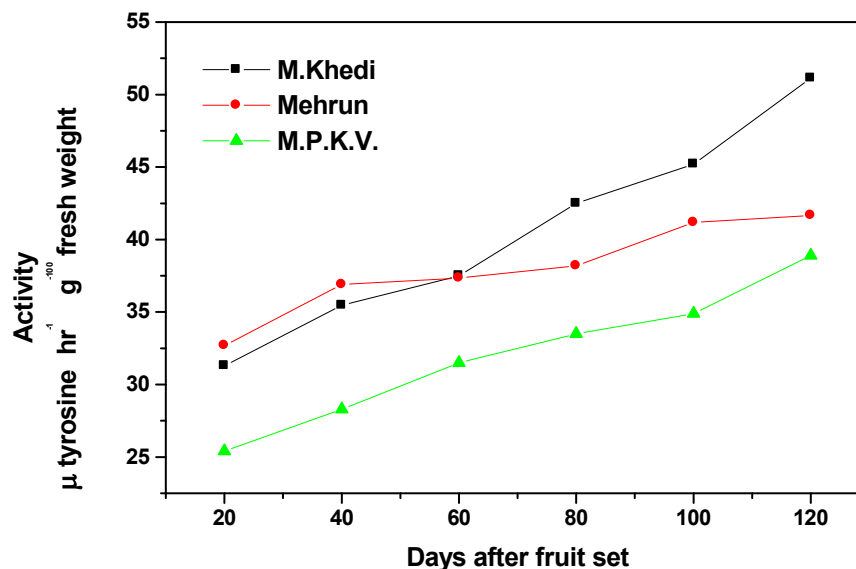


Fig.2. Changes in protease activity during development and maturity of ber fruit.

Similarly the increased protease activity of fruit pulp at maturity of the present investigation may also be attributed to maturity of fruit leading to the senescence as this enzyme has often associated with senescence (Sacher, 1973). Our results are in conformity with those of Dal and Pallavicini, (1975), Hobson, (1976), Kadam, (1993), and Abbas, (2002).

Conclusion

The decrease in protein content of the fruit pulp in all the three cultivars studied, during development and maturity of fruits may be attributed to hydrolysis of proteins by the increased activity of enzyme protease throughout the growth period.

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