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# Forecasting Ber Yield & Yield Contributing Characters - An Agrometeorological Appraoch

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**Abstract**

An agroclimatic study of the relationship between fruit yield and some other characteristics of ber fruit crop and weather parameters was carried out at PAU, Regional Research Station, Bathinda, Punjab with the help of empirical-statistical multiple regression models, which can be used as tool for quantitative crop yield forecast on operational basis. An attempt was made to correlate the ber fruit characteristics with weather over southwestern region of the state by agrometeorological model. Correlation was done for 7 years between ber fruit yield , fruit weight, acidity, pulp percentage, TSS and corresponding weather parameters namely minimum temperature, maximum temperature, morning relative humidity, evening humidity and rainfall. The analysis was done for four varieties of ber viz., Gola, Muria Murhera, Sandhura Narnaul and Katha Phal and the most suitable variety in terms of suitability of weather conditions was work out for southwestern region. The most sensitive period for fruit yield sensitivity appears to be during November to March months for the ber varieties under study. Different varieties responded differently with weather parameters for their different characteristics.

**Keywords**: Ber, regression model, fruit yield forecast.

## 1. Introduction

Fluctuations in crop behavior and yield are observed from year to year mainly due to weather, as different weather parameters affect crop at different stages of crop growth. Kettlewell *et al.* (1999) is one of the few to show how climate variability can affect the

quality as well as quantity of a harvested crop. Indian jujube (*Zizyphus mauritiana* Lamk) commonly known as *Ber* belonging to family *Rhamnaceae* being indigenous to India can be successfully cultivated in the hot arid regions of the country. Ber is a versatile tree and can be grown on a homestead, plantation, grassland or as a forest tree. The tree is suitable for marginal lands where other crops have no or limited production. Growth, flowering and fruiting development phases may vary depending on the temperature conditions. Ber trees can withstand very short periods of freezing temperatures, however, frost will damage the young twigs and developing fruits, and may kill the tree. Keeping this in view, an agro climatic study of the relationship between fruit yield, quality and quantitative characteristics of ber fruit crop and weather parameters was carried out with the help of empirical-statistical multiple regression models, which can be used as a tool for quantitative crop yield forecast on operational basis (Gill *et al* .,2012). An attempt was made to correlate the ber characteristics with weather in southwestern region of the state by an agrometeorological model.

## 2. Material and Method

The multiple regression models were developed for period from 2003 to 2009. different varieties of ber viz., *Gola*, *Muria Murhera*, *Sandhura Narnaul* and *Katha Phal* according to their sensitivity towards weather parameters and critical periods were identified. The weekly parameters were calculated corresponding to standard meteorological weeks (SMW) as demonstrated by Mavi et al (1992). A basic model has been developed by using weather parameters from a data series of 9 years, from 1970 to 1998. The average reported yield was taken as dependent variable with weather parameters as independent variables. In the correlation and regression technique significant correlation between yield & yield contributing characters of ber fruit and the meteorological parameters were identified. The critical periods when weather parameters exert significant influence on yield were located by analyzing the correlation coefficients for statistical and phenological significance. Multiple correlations of all the combinations were calculated by dropping one or more variables, which were found less significant. In the development, those parameters (maximum temperature, minimum temperature, morning & evening relative humidity and rainfall) which are statistically significant at the mandatory levels, were used in the final equation.

## 3. Results and Discussion

The most sensitive period for fruit yield for Gola cultivar of ber sensitivity appears to be during February and March months and the different weather parameters were negatively correlated with the yield during this period. Maximum temperature (Tmax, afternoon temperature) was highly negatively correlated with yield from 4-6 SMW with correlation coefficient of r = -0.67. For fruit weight, Maximum temperatures and Evening RH were negatively correlated with weight during the month of December with coefficient of correlation value -0.63 to -0.49, respectively. The acidity value of

fruit was positively correlated with both the maximum and minimum temperatures with value of r ranged from 0.42 to 0.64 whereas negatively correlated with rainfall (r = -0.62) and RH (r = -0.64) for SMW 6-9. The pulp percentage was positively correlated with maximum temperature and negatively correlated with rainfall. The TSS was positively correlated with maximum temperature (0.78) during the month of March.

The most sensitive period for fruit yield sensitivity for Muria Murhera cultivar of ber appears to be during the month of November. Temperature maximum (Tmax, afternoon temperature) was highly positively correlated with yield from 45-48 SMW with correlation coefficient of r = 0.63, whereas Minimum temperature (Tmin, morning temperature) was negatively correlated. The RH (morning and evening) was negatively correlated with fruit yield, with coefficient value of r = 0.58 and r = 0.34 respectively, during the month of December- January for RH (morning) and for the month of January for RH (evening). For fruit weight, all the weather parameters were positively correlated with coefficient of correlation value more ranging from 0.21 to 0.64 whereas the evening RH and Rainfall was negatively correlated. The acidity of the fruit was positively correlated with the maximum temperatures with value of r = 0.41 from 45-51 SMW whereas negatively correlated with RH (morning) and rainfall. The pulp percentage was mainly positively correlated with maximum and minimum temperature whereas it was negatively correlated with morning RH (r=0.49) and with rainfall (r=0.27). The TSS was positively correlated with maximum temperature (0.89) but negatively correlated with minimum temperature , Morning and evening RH.

The most sensitive period for fruit yield Sandhura Narnaul cultivar of ber sensitivity appears to be during November and December months. Temperature maximum and minimum was positively correlated with yield from SMW of 45-51 and 47-2 and with correlation coefficient of r= 0.66 and 0.34 respectively. It was observed that RH (morning and evening ) and rainfall was negatively correlated with fruit yield. Similarly for fruit weight, Maximum & minimum temperatures was positively correlated whereas evening RH and rainfall were negatively correlated with weight. The acidity of fruit was negatively correlated with RH (morning) and positively with RH (evening) and rainfall during the period of February-March. The pulp percentage was positively correlated with maximum and minimum temperature with coefficient value of r = 0.22 and 0.34 respectively while it was negatively correlated with morning RH (r = -0.32) and rainfall (r = -0.13) for the months of February-March. The TSS was positively correlated with maximum and minimum temperature but negatively correlated with RH (Morning and evening).

The most sensitive period for fruit yield for Katha Phal cultivar of ber sensitivity appears to be during January-February months. Temperature maximum (Tmax, afternoon temperature) was positively correlated with yield with correlation coefficient of r = 0.63, whereas Minimum temperature (Tmin, morning temperature) was negatively correlated with coefficient value of r = 0.44 at SMW 4-7. The RH and rainfall was negatively correlated with fruit yield, with coefficient value of r = -0.57and -0.31, respectively during the months of February-March. For fruit weight, all the weather parameters viz. Maximum & minimum temperatures, Morning RH was positively correlated while the RH (evening) were negatively correlated. The acidity

value of fruit was positively correlated with the maximum temperature while negatively correlated with minimum temperatures, RH (morning and evening) and rainfall during the period of November-December and with value of r ranges from -0.50 to -0.73. The pulp percentage was positively correlated with maximum temperature with value of r= 0.57 during the sensitive period for winter months of January whereas the morning RH showed negative correlation from the period of October- January, evening RH from the period of February-March and rainfall from the period of November-December. For TSS, all the weather parameters viz. Maximum & minimum temperatures and Morning and evening RH was positively correlated.

## 4. Conclusion

Different varieties responded differently with weather parameters for their different characteristics. The most sensitive period for fruit yield sensitivity appears to be during November to March months for the ber varieties under study**.** For fruit weight and TSS Maximum temperatures was positively correlated for all the varieties. The acidity value of fruit was positively correlated with the maximum temperature for all the varieties but negatively with Katha Phal. The pulp percentage was positively correlated with maximum and minmimum temperature.

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