Research Article

Correlation Coefficient Analysis of Some Mango (*Mangifera indica* L.) Hybrids

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Abstract

Experiment was conducted with eleven mango hybrids released from different research institute and a local commercial variety (Langra) to determine the genotypic and phenotypic correlation analysis of fruits to estimate the contribution of most important characters towards yield. Correlation coefficient was worked out to ascertain the relationship between different pairs of characters. Yield was significant and positively associated with fruit weight, fruit volume, fruit length, fruit breadth, stone length, skin weight, stone weight and pulp weight while skin and stone percentage exhibited non-significant negative correlation.

Keywords: Mango, Correlation, Yields

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Introduction

Mango (Mangifera indica L.) belongs to the family Anacardiaceae and acknowledged "King of fruits", due to its rich aromatic flavour, attractive colour, appearance and splendid taste. In India mango accounts for 39 per cent area of total fruit cultivation i,e 1.56 million hectare and 23 per cent of total fruit production i.e 10.64 million tons [3]. Though India has vast varietal diversity which is about 1100 named variety and as [4] reported that despite of enormous wealth of mango cultivars available in the country but ideal cultivar of mango is still lacking. But only few are grown on a commercial scale. Most of the present day cultivars appeared to have been selected for characters like size, quality and period of maturity. Some of the more important characters like precocity, dwarfness, prolificity and regularity of bearing, self fruitfulness and resistant to pests and diseases remain unsolved. These characters are now of vital important for making the best use of our shrinkage of land resources, reducing the cost of cultivation and for improving the productivity per unit area. However, combining all the desirable characters in single cultivar is difficult, so it is not possible, since mango is highly heterozygous crop.

Various indigenous varieties give poor yield of low quality fruits. Horticulturists are trying to develop varieties of early maturity and other characters like dwarfness, regularity, precocity high yielding capacity etc. to enhance the production and productivity of a crop. For the purpose many mango hybrids are developed in different parts of the country for last few decades to improve the yield and quality of fruits. However, all the hybrids are not suited for diverse climatic conditions. The Alphonso variety of mango which is great success in Maharashtra state had failed to do well in Northern India. Similar is the fate of Northern and Central Indian varieties when planted in South India. But this rule doesn't apply with equal force to all the varieties. These are instances when certain varieties have done equally well under diverse climatic conditions. The variety Langra become the sweetest variety in South India [16] and Neelum a South Indian variety excelled in yield per unit area in Gangetic plains of North India (Singh and Maurya, 1986). For this experiment eleven mango hybrids like Alfazli, Amrapali, Jawahar, Mahmoodbahar, Mallika, Neeleshan, Neeludin, Prabhashankar, Ratna, Sabri and Sundar Langra released from different universities, research stations and colleges were taken for the experiment and most important variety of this region i,e Langra was included as check. However, all the hybrids are not suited for diverse climatic conditions. So during the experiment the main focus was on hybrid variety having high yield potential and fruit quality to fulfill the demand of the day. It is therefore, worthwhile to identify the promising hybrids suitable for East Bihar condition.

Materials and Methods

The field experiment of this investigation was conducted in the orchard of Horticultural Garden and the Laboratory works in the Department of Horticulture (Fruit and Fruit Technology), Bihar Agricultural College, Sabour a campus of Bihar Agricultural University, Sabour, Bhagalpur. It is situated at longitude 87º2'72" east and latitude 25º15'40" North at an altitude of 46 meters above mean sea level in the heart of the vast Indo-Gangetic plain of North India, south of river Ganga.

The climate of this place is tropical to subtropical of slightly semi-arid in nature and is characterized by very dry summer, moderate rainfall and very cold winter. December and January are usually the coldest months when the mean temperature normally falls as low as 6.0ºC whereas May and June are the hottest months, having the maximum average temperature of 34.2ºC. Relative humidity varies from 93 to 38.60 per cent. The normal rainfall is about 1200 mm which is mostly precipitating during middle of June to middle of September.

During the course of study details of meteorological observation recoded as monthly maximum and minimum temperature, relative humidity, rainfall from Nov.'2010 to October, 2011 were collected from Agro-meteorological observatory, Bihar Agricultural College, Sabour, Bhagalpur have been presented in **Figures 1-3**.

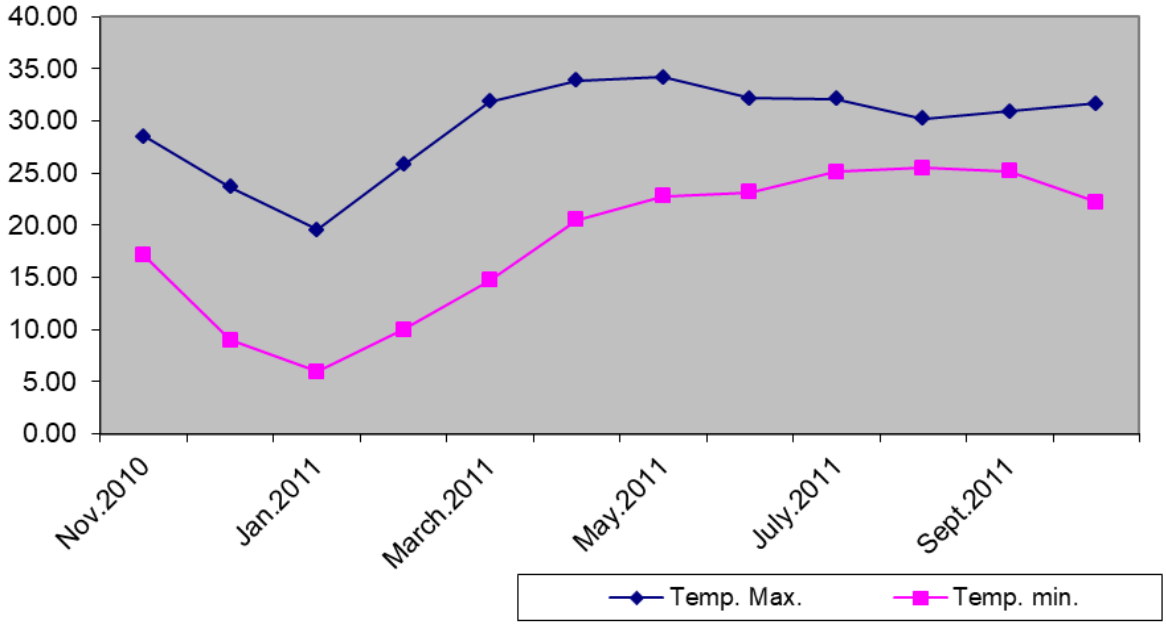

Figure 1 Temperature (^{0}C) during the experiment

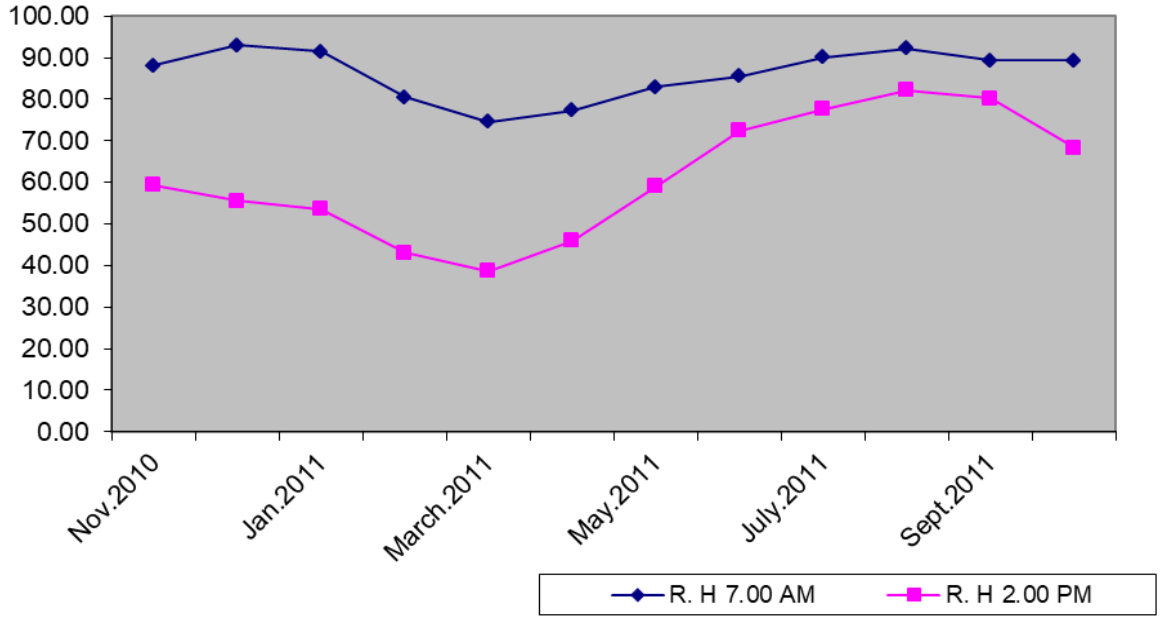

Figure 2 Relative Humidity (%) during the experiment

Initial and composite post-harvest surface (15 cm) soil samples from the experimental plot is to be carried out, and dried and pulverized to pass through 2 mm sieve. All the samples were mixed to form a composite sample and brought to the laboratory for chemical analysis. The available nitrogen of soil was 269 kg/ha, phosphorus 48 kg/ha and potassium 302 kg/ha. The soil of the experimental field was alkali in nature (pH 7.21) with organic carbon of 0.41%.

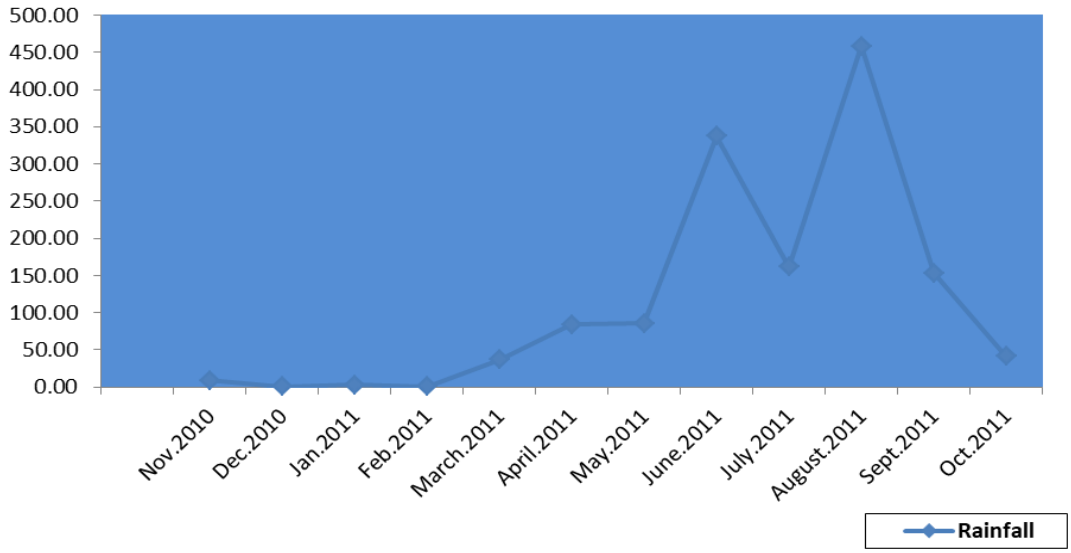

Figure 3 Rainfall (mm) during the experiment

Data collection

Five fully matured fruits from each replication were selected randomly from each of the twelve cultivars for the assessment of morphological and physical characters of fruits.

Morphological and physical characteristics of mango fruits

Weight of fruit (g)

The five fruits under each treatment of all three replications, which were used for the measurement of weight of fruits. The fruits were weighted carefully with the help of electronic balance in gram and the average weight of fruits was calculated.

Volume of fruit (cc)

The five fruits under each cultivar were taken out and mean volume was recorded replication wise. The volume of fruits was measured by water displacement method.

Size of fruits (cm)

Mature fresh harvested, five fruits from each cultivar were used to measure the length and breadth with the help of a slide calipers in cm and average size was worked out.

Size of stone (cm)

After separating the pulp and peel of the fruits the stones of these fruits were used to measure the length and breadth with the help of a slide calipers and average value of size of stone was worked out.

Skin percentage

The skin of fruit obtained after peeling were weighed on electronic balance and percentage was calculated with the following formula:

$$\text{Skin percentage} = \frac{\text{Weight of skin}}{\text{Weight of fruit}} \times 100$$

Stone percentage

The pulp was extracted from ripe fruits by hand. Then the average weight per stone was measured. The stone percentage was calculated on the basis of fruit weight.

$$\text{Stone percentage} = \frac{\text{Weight of Stone}}{\text{Weight of fruit}} \times 100$$

Pulp percentage

The weight of pulp was derived by deducting the total weight of skin plus stone form the weight of whole fruit and then multiplied by 100.

$$\text{Pulp percentage} = \frac{\text{Weight of Pulp}}{\text{Weight of fruit}} \times 100$$

Yield

The number of the total fruits harvested from tree, under trial was counted. Then the weight of total fruits of each tree was also recorded. The average number of fruits per tree as well as average weight of fruits in kilogram per tree was calculated.

Correlation coefficient

The correlation coefficients were worked out as per formula suggested by Al-Jibouri *et al*., (1958).

Results and Discussion

Selection primarily based on yield (which is polygenically controlled character) is not that much effective due to the fact that direct impingement for yield is difficult. A knowledge of degree of association of yield with its components is thus of great importance.

Total yield per plant had significant positive correlation with fruit weight, fruit volume, fruit length, fruit breadth, stone length, skin weight, stone weight and pulp weight. Similar results were obtained by Gut ridge and Anderson (1973), Hortynski (1989), Adelman *et al.* (1992). The baseline correlation of yield with fruit weight fruit volume, fruit length, fruit breadth, stone length, skin weight stone weight and pulp weight show that these charades are more yield contributing and selection on basis of these characters will be more effective to select the individuals with more yield as repeated by Singh *et al.* (1967), Yadav and Singh (1985), Gill and Dhillon (2008) and Kumar *et al.* (2009).

The correlation coefficient among different characters revealed that fruit weight was positively associated with almost all the characters but association was highly significant with fruit weight fruit volume, fruit length, fruit breadth, stone length, skin weight stone weight pulp weight and yield. However, its association with stone breadth and pulp percentage was non-significant. Its association with skin and stone percentage was negative and fruit volume also exhibited highly significant correlation with fruit length, fruit breadth, stone length, skin weight, stone weight, pulp weight and yield. Its association with stone breadth, and pulp percentage was found non- significant positive correlation. But skin and stone percentage showed non-significant correlation. Fruit length had highly significant positive correlation with characters like fruit breadth, stone length, pulp weight and yield but significant correlated with pulp percentage. Its association with stone breadth, skin weight and stone weight was negative and non-significant. Fruit breadth showed highly significant positive association with stone length, skin weight, pulp weight and yield. However its association with stone breadth, stone weight, skin and pulp percentage was non-significant. Its allocation with stone percolate was negative. Stone length was positively and strongly correlated with pulp weight and pulp percentage and yield. Its association was negative and significant with stone percentage and negatively correlated with skin percentage. Stone breadth was failed to show significant correlation with all the characters. Skin weight was highly and positively correlated with stone weight, pulp weight and yield. However, its association was positive with skin and stone percentage but negative with pulp percentage stone weight expressed highly significant positive correlation with pulp weight and yield. Its association was also profiting with skin and stone percentage but negative with pulp percentage. Pulp weight showed non- significant correlation with all the characters except yield which was highly correlated with pulp percentage. Its association was also negative with yield but non-significant. Treatments show strong correlation with pulp percentage but negative with yield Kulkarni and Rameshwar (1981), Chaudhary and Desai (1996), Kumar (1997), Singh *et al.* (1998), Dhillon *et al.* (2004), Singh and Singh (2004) and Dutta *et al*. (2008).

The association of different characters clearly indicates that fruit weight, fruit volume, fruit length fruit breadth, stone length and pulp weight governed all the characters in positive direction except skin and stone percentage. Skin weight also showed positive correlation with all the characters except pulp and seed percentage. The length and

breadth of fruit increased together to maintain the shape of fruit. The negative association of skin and stone percentage with other characters indicates that higher pulp content will always be beneficial. These results are in agreement with the findings of Sharma and Josan (1995), Rajput and Pandey (1998), Chatterjee *et al*. (2005), Kumar and Singh (2005), Singh (2009), and Majumder *et al*. (2012).

Table 1 Correlation coefficient between yield and yield contributing characters in mango

Characters	Fruit weight	Fruit volume	Fruit length	Fruit Breadth	Stone length	Stone breadth	Skin weight	Stone weight	Pulp weight	Skin %	Stone %	Pulp %	Yield
Fruit weight	1.0000	0.9942**	0.7777**	0.08205**	0.7274**	0.3090	0.8952**	0.7917**	0.9869**	-0.1736	-0.2520	0.2352	0.9314**
Fruit volume		1.0000	0.7469**	0.8239**	0.7090**	0.3523	0.9029**	0.7994**	0.9829**	-0.1537	-0.2277	0.2126	0.9222**
Fruit length			1.0000	0.7746**	0.9483**	0.1537	0.5615	0.3062	0.8183**	-0.4330	-0.6750	0.5969*	0.6583*
Fruit breadth				1.0000	0.7205**	0.4969	0.8154**	0.4358	0.7966**	0.0149	-0.3055	0.1795	0.6828*
Stone length					1.0000	0.3156	0.5014	0.3268	0.7834**	-0.4709	-0.6173*	0.5836*	0.6761*
Stone breadth						1.0000	0.4087	0.2822	0.3072	0.1627	0.1029	-0.1261	0.4142
Skin weight							1.0000	0.8183**	0.8195**	0.2787	0.1262	-0.1939	0.8462**
Stone weight								1.0000	0.7374**	0.1025	0.2799	--0.2021	0.8426**
Pulp weight									1.0000	-0.3193	-0.3776	0.3755	0.9133**
Skin %										1.0000	0.8377**	-0.9492**	-0.1230
Stone %											1.0000	0.9668**	-0.0961
Pulp %												1.0000	0.1217

*, ** Significant at 5% and 1% probability levels, respectively

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