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EFFECTS OF WEATHER PARAMETERS ON FLOWERING AND FRUITING BEHAVIOR OF MANGO (*Mangifera indica* L)

D.P. Saha[1], Ravindra Kumar[1], Mithilesh Kumar[2] and V.B. Jha[3]*

[1]*Department of Fruit and Fruit Technology, Bihar Agricultural College, Sabour (Bhagalpur)*

[2]*Department of Plant Pathology, Bihar Agricultural College, Sabour (Bhagalpur)*

[3]*Department of Plant Breeding, Bihar Agricultural College, Sabour (Bhagalpur)*

**Corresponding Author (V.B. Jha) Email : vbbau@rediffmail.com*

ABSTRACT

A field experiment was conducted at AICRP on mango orchard at Bihar Agricultural College, Sabour (Bihar) during December to July in 2009-10 and 2010-11 on 23 years old plantations. The variation in flowering and fruiting behavior might be due to variation in genetic makeup of all the four cultivars namely Bombay, Zardalu, Langra, and Totapuri. The earliest emergence of flower buds, 50% flowering. 100% flowering and first fruit setting were observed with Zardalu in temperature maximum 18.7° C to 33.5°C and minimum in 6.8°C to 16.4°C during the period whereas the maximum (205) number of fruits at marble stage observed with Bombay in between the temperature range of 16.4 to 33.5°C. The total fruit drop was recorded minimum (80.86 %) with Totapuri in the temperature range of 24.2 to 36.8°C. The maximum number (294.67) of fruits per plant at harvest and T.S.S. were noted with cv. Zardalu but the highest fruit weight (348.00 g/ fruit) and yield (71.10 kg) per plant recorded with Totapuri. The maximum TSS (18.69°Brix) and minimum acidity (0.25%) was found with Bombay.

Mango (*Mangifera indica* L.) trees perform well both under tropical and subtropical climatic conditions. It requires good rain fall during its growing season (June to October) and rainless dry weather from November to February. Flowering season of mango tree in a region is mainly influenced by climatic conditions especially the temperature and humidity level. The growth and development of a variety having a definite genetic character in particular set of environmental condition shows positive or negative relation. Rains during pre-flowering and flowering period lead to delayed flowering and increase vegetative growth. Cloudy weather at the time of flowering results in heavy flower drop mainly due to increased population of hoppers. India has unique and varied climate which enable to grow successfully almost all, varieties of mango all over the country. Cultivation of mango faces so many problems due to environmental conditions. Climatic factor viz. temperature, Humidity, wind and sunshine affects the flowering, fruiting and quality of fruits. The varieties of North, South and Central region are found suitable for this region. Weather is highly variable in this region; weather affects the flowering, fruiting and quality behaviors of mango varieties. The variations observed in fruiting behave may be attributed to the genetic nature of varieties and climatic factors. The variety with lower fruit drop is associated with the arrangement of Stalk with the fruit and the late formation of abscission layer. These findings similar with those of Shrivastava *et al.* (1987), Muhammad *et al.* (2002) and Kumar and Jaiswal (2003). Temperature is one of the most important environmental factors, which effect the flowering, pollination, fruit set of mango variety, cloudy weather may also act as one the factor for unfruitfulness the mango plant by making condition favorable for development and spread of diseases. Comprehensive characterization of coal fly ash for beneficial utilization towards environment reported by Das *et al.* (2011). The present study was, undertaken with the objective to find out and determine the study the effect of weather parameters (Abiotic factors) on flowering fruiting and quality behavior of mango cultivars.

MATERIALS AND METHODS

A field experiment was conducted at AICRP on mango orchard at Bihar Agricultural College, Sabour (Bihar) during December to July in 2009-10 and 2010-11 on 23 years old plantations. The variation in flowering and fruiting behavior might be due to variation in genetic makeup of all the four cultivars namely Bombay, Zardalu, Langra, and Totapuri. In general, the lowest and highest temperature goes above 6.0° C up to 38.5° C respectively (Fig.1). The annual rainfall varies from 1079.2 mm to 1080.3 mm which is received mainly from July 2009-10 and 2010-11 (Fig.-2). The experiment comprising 4 treatments (varieties), Langra, Bombay, Zardalu and Totapuri. The spacing between row to row and plant to plant was 08 × 08 meter, respectively. Observations were recorded on twigs of four different

Table-1 : Meteorological data of B.A.C., Sabour for the year 2009-10 and 2010-11. (Average Monthly) : (April to June).

Month	Temperature (°C)				Relative Humidity (%)				Rainfall (mm)		Wind speed Km/hr.	
	Maximum 2009-10	Maximum 2010-11	Minimum 2009-10	Minimum 2010-11	7 AM 2009-10	7 AM 2010-11	2 PM 2009-10	2 PM 2010-11	2009-10	2010-11	2009-10	2010-11
July	33.0	32.5	26.1	25.8	91	91.1	72	74.5	261.1	240.9	7	7.7
August	32.5	33.1	25.7	26.4	93	91.7	76	72.8	361.2	163.3	6.2	5.9
September	33.4	32.2	25.4	25.5	90	91.8	72	76.3	126	112.5	4.8	6.2
October	31.3	31.2	20.0	22.3	91	91.0	63	71.0	154.1	21.4	3.4	3.9
November	27.8	28.5	15.0	17.1	93	88.1	56	59.3	2.7	9.4	2.9	2.8
December	24.1	23.7	9.1	9.0	96	93.0	50	55.5	0	0.6	2.4	2.4
January	18.7	19.6	6.8	6.0	98	96.5	65	53.5	0	3.00	5.7	4.1
February	26.1	25.8	10.4	10.0	90	85	44	43.0	5.2	0.8	3.9	3.7
March	33.5	33.5	16.4	16.4	77	77	35	35	6.2	6.2	4.5	4.5
April	38.5	34.8	21.9	23.5	73	83	38	55	8.1	197.2	6.9	8.5
May	36.8	36.9	24.2	26.1	78	79	48	53	60.2	63.9	8.4	6.5
June	35.5	33.0	25.9	26.1	82	91	63	72	94.4	261.1	7.4	7
Total (July to June)									1079.2	1080.3		

Table-2 : Flowering behavior of mango cultivars in relation to weather parameter.

Sl. No.	Treatment	Date of first appearance of bud		Date of 50% flowering		Date of 100% flowering		Date of first fruit set		Date of fruits at marble stage		Date of Harvesting	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
1.	Langra	07.02.2010	01.02.2011	04.03.2010	28.02.2011	14.03.2010	09.03.2011	18.03.2010	12.03.2011	03.04.2010	30.03.2011	25-06-2010	21-06-2011
2.	Bombay	26.01.2010	23.01.2011	26.02.2010	24.02.2011	11.03.2010	08.03.2011	15.03.2010	10.03.2011	25.03.2010	22.03.2011	05-06-2010	05-06-2011
3.	Zardalu	24.01.2010	20.01.2011	22.02.2010	20.02.2011	05.03.2010	01.03.2011	10.03.2010	07.03.2011	29.03.2010	25.03.2011	09-06-2010	07-06-2011
4.	Totapuri	25.01.2010	26.01.2011	24.02.2010	21.02.2011	08.03.2010	02.03.2011	13.03.2010	09.03.2011	03.04.2010	04.04.2011	06-07-2010	01-07-2011

Table-3 : Flowering and Fruiting behavior of mango cultivars in relation to weather parameter (Pooled).

Sl. No.	Treatment	Fruit drop at 15 days intervals (%)					Fruit weight (g/fruit)	Nos. of fruit/plant	Yield (Kg/plant)	T.S.S. (°Brix)	Acidity (%)
		No. of fruit set at marble stage (0 days)	15 days	30 days	45 days	Total fruit drop %					
1.	Langra	130	82.82	4.38	2.02	89.23 (71.07)*	309.06	203.67	62.94	18.16	0.25
2.	Bombay	205	75.02	5.29	1.23	81.55 (64.95)*	184.22	281.00	51.76	18.69	0.25
3.	Zardalu	165	77.88	3.60	2.09	83.57 (66.28)*	186.00	294.67	54.80	17.47	0.26
4.	Totapuri	142	77.13	2.20	1.52	80.86 (64.16)*	348.000	204.33	71.10	17.73	0.27
	C.D. at 5%	N.S.				(N.S)		22.39	4.47	N.S.	0.153

*Transformed mean value

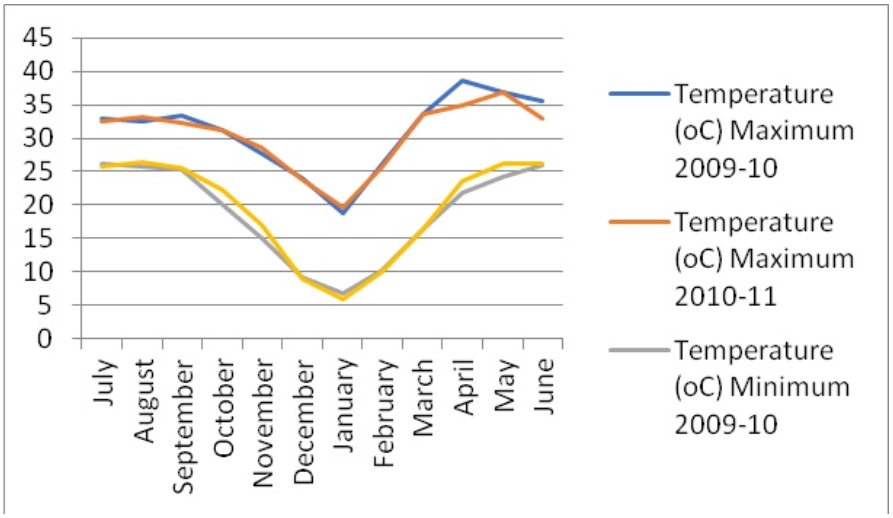

Fig.-1

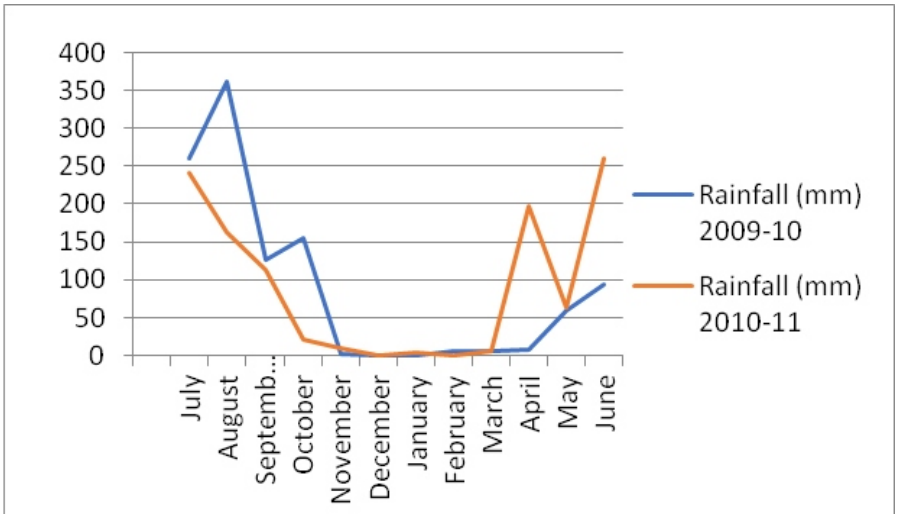

Fig.-2

directions of the tree and then by averaging them for date of first appearance of bud, date of 50% flowering, Date of 100% flowering, number and date of first fruit setting (mustard size of fruits at panicle, Date and number of fruits at marble stage (pea / marble size of fruits) and fruit drop (%).Yield attributing characters: weight of per fruit (g), number of fruits per plant, yield (Kg/plant) were recorded upon the average of ten fruits of average size collected randomly from the tree and fruit chemical quality-TSS (°Brix) was determined in ripen mango fruits using a hand refractometer and acidity (%) calculated by titrating the fruit pulp aliquot against 0.1N NaOH (A.O.A.C., 1984).

RESULTS AND DISCUSSION

The outcome of the investigation revealed that the earliest emergence of flower bud was observed in Zardalu followed by Bombay (Table-2) in the maximum temperature range of 18.7 to 19.6^{O}C and minimum temperature range of 6.0 to 6.8^{O}C (Table-1) and Langra flowers appeared late in the maximum temperature range of 25.8 to 26.1^{O}C and minimum temperature range of 10.0 to 10.4^{O}C (Table-1). On the other hand, the 50%, 100% of flowering and first fruit setting was earliest in Zardalu followed by Totapuri and latest in Langra (Table-2) in the maximum temperature range of 25.8 to 33.5^{O}C and minimum temperature range of 10.0 to 16.4^{O}C (Table-1) during the period. During development of fruits after fruit setting, Bombay recorded not only the earliest fruits at marble stage but also the maximum (205) number of fruits at marble stage followed by Zardalu (Table-3) within the temperature range of 16.4 to 33.5^{O}C (Table-1). Fruit drop in mango during initial stages is reported to vary with growth of fruitlets. It was more in initial stage and least on later stage (active fruiting growth phase). In total minimum (80.86 %) fruit drop was calculated under Totapuri followed by Bombay (81.55 %) and

maximum (89.23 %) under Langra (Table-3) in the maximum temperature range of 33.5 to 38.5^{O}C and minimum temperature range of 16.4 to 26.1^{O}C, relative humidity ranged from 35 to 83% whereas average rain fall was varied from 6.2 to 197.2 mm and wind velocity 4.5 to 8.5 km/hrs. (Table-1) during the period of March to May ((Table-1 correlated with Table-2). Such findings correlate with Dod et al (1999) on mango in Akola dist of Maharashtra.

The earliest harvesting was observed under Bombay (05th June) followed by Zardalu, Langra and Totapuri. The finding is similar with those of Muhammad et al. (2002a), Kumar and Jaiswal (2003) and Shrivastava et al. (1987). The maximum per fruit weight (348.00 g) and yield (71.1 kg/plant) were noticed with Totapuri followed by Langra (309.6g and 62.94kg/plant respectively) whereas minimum with Bombay (184.22g and 51.76kg/plant respectively). The highest number of fruits per plant (294.67) recorded with Zardalu followed Bombay (281.00) and lowest with Langra (203.67) followed by Totapuri (204.33). These similar findings those of Anila and Radha (2003), Muhammad *et al.* (2004), Kumar and Jaiswal (2003), Rajput and Panday (1997) and Shinde *et al.* (2001).

The maximum TSS (18.69^{o}Brix) was found with Bombay followed by Langra (18.16^{o} Brix) and minimum (17.47^{o} Brix) with Zardalu. The acidity found minimum (0.25 %) to Bombay and Langra whereas the maximum (0.27 %) with Totapuri these findings are supported with the works of Nilesh and Banik (2005).

REFERENCES

1. Anila, R. and Radha, T. 2003. Physico- chemical analysis of mango varieties under kerala conditions. *J. of trop. Agri.* 41: 20-22.
2. A.O.A.C.1984. (*Official Method of Analysis*). 14th Edition, Association of Official Agriculturist Chemists. Washington D. C., USA, p 16
3. Das, A., Jain, M.K. and Singh, S. 2011. Comprehensive characterization of coal fly ash for beneficial utilization towards environment. The Ecoscan. 5(3and4): 127-130.
4. Dod, V.N., Bharad, S.G. and Jadhao, B. J. 1999. Flowering and fruiting behaviour of different varieties of mango (*Mangiferaindica* L.) under hot and dry climatic condition of Akola. *Crop Res. Hisar*. 17(3): 329-332.
5. Kumar, N. and Jaiswal U. S. 2003. Bearing behaviour of some west and south Indian mangoes. *Hary. J. of Hort. Sci.* 32(3/4): 154-158.
6. Muhammad A., Muhammad U., Muhammad J. J. and Muhammad M. K. 2004. Comparative study of flower sex ratio in different cultivars of mango. *Int. J. Agric. and Bio.* 04(2): 220-222
7. Muhmmad, A., Muhammad, U., Fatima, B., Jaskani, M. J. and Khan, M. M. 2002. Fruit set and drop behaviour of three commercial cultivars of mango. *Pak. J. of Agric. Sci.* 39(2): 129-131.
8. Nilesh, B. and Banik, B. C. 2005. Yield and physico chemical properties of some mango cultivars in new alluvial zone of West Bengal. *Envi. and Eco.* 23(3): 503-506.
9. Rajput, S. S. and Pandey, S. D. 1997. Studies on physico-chemical characteristics of some mango cultivars under Chhattisgarh region of Madhya Pradesh. *Hort. J.* 10(1): 9-14.
10. Shinde, A.K. Burondkar, M. M., Bhingarde, R. T., Waghmare, G. M., Rangwala, A. D. and Wagh, R.G. 2001. Heat unit requirement for fruit maturity in mango varieties. *In. J. of Pl. Physio.* 6(2): 194- 196.
11. Shrivastava, S.S., Asati, M.K., Patel, M.P., Tiwari, B.L. and Bhadauria, U. P. S. 1987. Evaluation of mango varietis in M.P. *In. J. Hort.* 44(3/4): 97-201.