



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 2806-2808
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www.thepharmajournal.com
Received: 04-10-2022
Accepted: 13-11-2022

DR Bhise
M.Sc. Scholar, Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India

AM Bhosale
Assistant Professor, Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani Maharashtra, India

MA Kharat
M.Sc. Scholar, Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India

KM Naik
M.Sc. Scholar, Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
DR Bhise
M.Sc. Scholar, Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India

Effect of heat units and time period on biometrical parameter of different varieties of mango (*Mangifera indica* L.)

DR Bhise, AM Bhosale, MA Kharat and KM Naik

Abstract

An investigation entitled “Effect of heat units and time period on maturity indices of different varieties of mango (*Mangifera indica* L.)” was undertaken at AICRP Irrigation and water management field, Department of Horticulture, College of Agriculture Parbhani, University, Vansantrao Naik Marathwada Krishi Vidyapeeth Parbhani. The experiment was laid out in RBD with four treatments of mango. The mango fruit harvested from tree were selected for the study and in each tree. From result of present investigation its revealed that among different time period taken for maturity significantly influenced the biometrical parameter cv. Kesar, Neelum, Mallika, Totapuri. Maximum fruit set are recorded in T1 *i.e.*, Kesar (38.50) was found to be best. Percentage of sex ratio is measures is maximum sex ratio was recorded T1 *i.e.*, Kesar (8.65). Fruits of Kesar variety with accumulation of 1320 HU was found to be best.

Keywords: Heat units, *Mangifera indica* L., biometrical parameter

Introduction

The world and is rightly designated as “King” of all fruits. Mango belongs to family Anacardiaceae, which is originated in Indo-Burma at an early date. The word 'mango' originated as early as 16th century from the ancient Tamil word 'mangos'. Historical records suggest that its cultivation as a fruit tree originated in India around 4000 years ago. It was virtually unknown to any botanist until 1605 when Carol Clusius first mentioned of it in its writings. The name *Mangifera* was given for the first time by bontius in 1658 when he referred to this plant as arbor *Mangifera* (as tree producing mango). Later it was mentioned in the literature as *Mangifera indica*, *Mangifera domestica* or *Mangifera sylvatica*. In the early period of domestication, mango trees probably yielded small fruits, but folk selection of superior seedlings over many hundreds of years would have resulted in the production of larger fruits. Before 1970, mangoes were little known to consumers outside the tropics and the trade involving fresh fruit was non-existent. Around 2000 varieties of mangoes are found in the world. Out of them, majority of varieties are cultivated in India. India produces around 19.68 million metric tonne of mangoes every year from 2.26 million ha area (Anon., 2017) [1]. Gujarat itself produces 13 lakh tons of mango which contributes around 7 per cent in the total lot. Especially in Junagadh district total of 84120 tonne mango produce from 21ha area (Anon., 2017) [1].

Heat unit

The idea of Heat Unit or Growing Degree Days was introduced almost in 1730, by the French scientist Rene A. F. de Reaumur. Since that time, Heat Unit has been used as a means to predict the growth stages of many living organisms. Growing Degree Days (GDD) are also called Growing Degree Units (GDUs) or Heat Units (HUs).

The Heat Unit concept is based on the following assumptions

- Growth or development occurs only when the average daily temperature exceeds a certain threshold, known as the base temperature, below which the organism does not grow or grows slowly.
- Growth and development are closely related to daily mean temperature accumulations above the base tem.

- c. For a given species, the number of accumulated heat units between growth stages remains constant across years, locations, and climate.
- d. A certain amount of heat is required to provide enough energy for the organism to move to the next development stage, which depends on weather conditions, the amount of time can vary.

HU are the number of temperature degrees above a certain threshold (base) temperature within consecutive 24 hrs of period or a Heat unit is defined as a mean daily temperature one degree above (base) temperature.

HU or GDD = Mean Daily Temperature - Certain (Base) Temperature.

Material and Method

The experiment was conducted at AICRP Irrigation and water management field, Department of Horticulture, College of Agriculture, Vansantrao Naik Marathwada Krishi Vidyapeeth Parbhani. During investigation physical characteristics of mango fruit were evaluated immediately after harvest stage. The experimental material consists of fruit of Kesar, Mallika, Neelum, Totapuri varieties were obtained from AICRP Irrigation and water management field, Department of Horticulture, College of Agriculture, Vansantrao Naik Marathwada Krishi Vidyapeeth Parbhani. Fourtyeight uniform mango tree of each treatment selected for the study. The tagged fruit of uniform size were harvested for conducting experiment. The experiment was laid out with RBD with three replication and four treatments viz, T1 Kesar, T2 Mallika, T3 Neelum, T4 Totapuri. The observation was recorded and when immediately after harvest stage. For studying biometrical parameter ten fruits were randomly selected and observation were recorded on the biometrical characteristics i.e., days to 50% flowering, hermaphrodite flower, number of male flowers, sex ratio, days to fruit set from flowering, days of fruit maturity, heat unit required. Statistical analysis of data of various characters will be carried out as per Randomized Block Design. Analysis of variance will be worked out using standard statistical procedures as described by Panse and Sukhatme (1985)^[10].

Result and Discussion

Looking to the days to 50% flowering, it was observed that the content of days to 50% flowering was increases with progress days. The maximum days of fruit set is T4 i.e., Totapuri (33 days) was recorded. Whereas the minimum 50% flowering is recorded as T1 i.e., Kesar (28 days). The differences in panicle emergence times of different mango cultivars appear to be due to inherent character, temperature, and photoperiodism. The cultivars also differed significantly in terms of 50% flowering time and bud break to full bloom in this experiment. The finding also supported with results similar results maximum flowering T4 and minimum T1. similar Mahadik *et al.* (2021)^[9] are accordance present study. Looking to the male flowers, it measured full blooming stages. The maximum flowers are recorded T4 i.e., Totapuri (2106.36) was recorded. Whereas the minimum male flowers are recorded as T1 i.e., Kesar (1538.03). The finding also supported with results similar results maximum male flowers T4 and minimum flowering T1. Similar Reddy *et al.* (2022)

^[11] G.A. Geetha *et al.* (2016)^[6], Yadav *et al.* (2014)^[14]. Looking to the hermaphrodite flowers is measures at full blooming stages. The maximum hermaphrodite flowers are recorded T3 i.e., Neelum (460.40) was recorded. Whereas the minimum male flowers are recorded as T1 i.e., Kesar (171.05). Similar results also founding maximum hermaphrodite flowers T3 Neelum and minimum hermaphrodite flowers T1. Mango is a terminal bearer and polygamous plant that produces both perfect and staminate flowers. Both types of flowers are andromonoecious, meaning they are born on the same inflorescence Litz *et al.* (2003)^[5]. The intensity of the male and perfect flower varies according to variety, panicle position, and climatic conditions. The number of hermaphrodite flowers varied statistically between parental mango cultivars. The percentage of hermaphrodite flowers varied significantly. Similar Reddy *et al.* (2022)^[11], Khushboo Azam *et al.* (2018)^[2], G.A. Geetha *et al.* (2016)^[6]. Percentage of sex ratio is measures is maximum sex ratio was recorded T1 i.e., Kesar (8.65). minimum was recorded T3 Neelum The results also founding sex ratio is higher T1 kesar and lowers T3 Neelum sex ration. Similar results also found. Yadav R.K., *et al.* (2014)^[14], G.A. Geetha *et al.* (2016)^[6], Khushboo Azam *et al.* (2018)^[2] Reddy *et al.* (2022)^[11]. The initially fruit set measures to flowering after set of fruit are measures the maximum fruit set are recorded in T1 i.e., Kesar (38.50). Whereas the lowest fruit set from flowering to T4 i.e., 4 Totapuri (30.00). Maximum fruit set from flowering climatic effect of heat units days to fruit set from flowering maximum fruit set recorded T1 Kesar Shinde *et al.* (2001)^[12], Zagade *et al.* (2014)^[13]. The initially fruit maturities required days for fruit maturities are recorded minimum days found in T1 i.e., Kesar (96.61). whereas maximum days required for T4 i.e., Totapuri (110.84). The results also founding days required for fruit maturity minimum day and maximum days required for fruit maturities. Similar results founding Halepotara *et al.* (2019)^[17], Zagade *et al.* (2014)^[13] Shinde *et al.* (2001)^[12]. The initially fruit maturities are required for maximum heat unites are required T4 i.e., totapuri (1529 HU). Whereas minimum heat units are required T1 i.e., kesar (1320 HU). The results also founding heat unites required for maximum and minimum heat unites are required. The similar results also founding Estrada (1996)^[4], Shinde *et al.* (2001)^[12] Debnath and Mitra (2008)^[3], Kanzaria (2015)^[8], Halepotara *et al.* (2019)^[17]. The initially fruit maturities are required for maximum heat unites are required T4 i.e., totapuri (1529 HU). Whereas minimum heat units are required T1 i.e., kesar (1320 HU). The results also founding heat unites required for maximum and minimum heat unites are required. The similar results also founding Estrada *et al.* (1996)^[4] Shinde *et al.* (2001)^[12] Debnath and Mitra (2008)^[3], Kanzaria (2015)^[8], Halepotara, *et al.* (2019)^[17].

Table 1: Effect of heat units in days to 50% flowering in different varieties of mango.

Treatment details	Days to 50% flowering
T1 Kesar	28.00
T2 Mallika	32.00
T3 Neelum	30.00
T4 Totapuri	33.00
S.Em. ±	1.07
C.D.at 5%	3.43

Table 2: Effect of heat unites in hermaphrodite flowers, sex ratio and male flowers in different varieties of mango

Treatment details	Hermaphrodite flowers	Sex ratio	Male flowers
T1 Kesar	171.05	8.65	1538.03
T2 Mallika	402.34	4.83	1990.55
T3 Neelum	460.40	4.03	1872.26
T4 Totapuri	250.04	8.63	2106.36
S.Em. \pm	6.266	0.23	24.32
C.D.at 5%	20.04	0.74	77.80

Table 3: Effect of heat units in days to fruit set from flowering and days required for fruit Maturity in different varieties of mango

Treatment details	Days to fruit set from flowering	Days required for fruit maturity
T1 Kesar	38.50	96.61
T2 Mallika	31.25	100.44
T3 Neelum	33.75	103.42
T4 Totapuri	30.00	110.84
S.Em. \pm	0.6922	0.7855
C.D.at 5%	2.21	1.85

Table 4: Effect of heat unites in date of fruit maturity and heat unites in different varieties of mango

Treatment details	Heat unites required
T1 Kesar	1320.00
T2 Mallika	1526.00
T3 Neelum	1426.00
T4 Totapuri	1529.00
S.Em. \pm	1.07
C.D.at 5%	3.43

Conclusion

On the basis of the experiment conducted in the field it can be concluded that effect of heat unit and time period taken for maturity, significantly influenced the biometrical parameters in different varieties of mango. Hence, for optimum biometrical parameter Mallika mango should be harvested is of good quality.

Acknowledgment

The author thankful to Dr. A.M. Bhosale, Assistant Professor, Department of Horticulture, College of Agriculture VNMKV, Parbhani.

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