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Mango Panicle Parameters: Comparative Study and Assessment of Weather Parameters Effect

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ABSTRACT

A field experiment was conducted at Navsari Agricultural University, Navsari, Gujarat, India during the year 2019-20 and 2020-21 to study the mango panicle characteristics and correlation between panicle growth parameters and climatic parameters. This study was conducted on seven mango varieties *viz.,* Sonpari, Alphonso, Amrapali, Kesar, Dashehari, Totapuri and Rajapuri. Kesar recorded maximum length of panicle (37.55 cm) which was at par with Alphanso (35.66 cm) and Amrapali (32.80 cm). The maximum width of panicle (22.76 cm) was recorded in Kesar which was at par with Rajapuri (19.63 cm). Mango cv. Alphonso recorded maximum diameter of primary rachis (5.65 mm), which was at par with Kesar (5.60 mm) and Rajapuri (5.18 mm). Maximum numbers of spikelets panicle^{-1} (above 10 cm) were recorded in cv. Kesar (14.00), which was at par with Alphonso (10.95). In correlation study it was noticed that , during the year 2020-21 panicle breadth was significantly positive correlated with minimum relative humidity (r = 0.85*) and total rainfall (r = 0.81*). During the year 2019-20, it was observed that, correlation between diameter of primary rachis and climatic parameters *viz.,* maximum temperature (r= - 0.81*), minimum temperature (r= - 0.92**) and bright sunshine hours (r= -0.91**) were significant and negatively correlated.

Key Words: Climatic parameters, Correlation coefficient, Mango, Panicle.

INTRODUCTION

Mango (*Mangifera indica* L) belongs to family Anacardiaceae is among the most widely spread fruit crops across the length and breadth of the county except temperate regions. Family Anacardiaceae madeup of 73 genra and 830 species and originated in India Myanmar region (Yamanaka *et al*, 2006). This crop has huge diversity because of its allopolyploid nature, out breeding and phenotypic variations arising from varied agro climatic conditions (Ravishankar *et al*, 2000). Mango variability can be simply accessed by studying their inflorescences. Mango inflorescence is developed on reproductive shoot called as panicle. This crop produces panicles having hundreds of inconspicuous flowers, of which at most three or four flowers will develop fruits. The mango panicles among different varieties are predominantly terminal and varied in shape, length, breadth, flower colour and rachis diameter. Bhamini *et al* (2018) reported different shapes of mango inflorescences *viz.* pyramidal, conical and broadly pyramidal .

Among different internal and external factors, mango flowering is mostly affected due to particular varietal characters and its interaction with weather conditions. Evaluation of mango varieties for given ecological conditions is one of the pre-requisites for successful mango cultivation (Singh and Singh, 1996).The limited reports on the floral biology of popular cultivars of mango in South Gujarat promoted us to analyse the panicle behaviour of mango cultivars.

MATERIALS AND METHODS

The present investigation was carried out at Regional Horticultural Research Station, Navsari Agricultural University, Navsari during two consecutive seasons 2019-20 and 2020-21**.** Uniform fifteen year old trees of seven mango varieties *viz.*, Sonpari, Alphonso, Amrapali, Kesar, Dashehari, Totapuri, Rajapuri were selected for this study. The objective was to study the variations in panicle growth parameters and degree of relationship between panicle growth characters and climatic parameters**.**

The experiment was laid out in Completely Randomized Block Design consisting of seven

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treatments *i.e.* mango varieties which were repeated three times with two trees repitation^{-1}. Different panicle growth parameters were subjected to analysis of variance as suggested by Panse and Sukhatme (1985)

Correlation study between climatic parameters and panicle growth characters *viz*., length and width of panicle, diameter of primary rachis and number of spiklets above 10 cm were studied. To study the correlation between panicle growth parameters and mean of environmental factors for effective time period (panicle emergence to complete flower opening) were considered.

Weather variables *viz.,* maximum temperature (^{0}C), minimum temperature (^{0}C), relative humidity (%), average wind velocity (km hr^{-1}), total bright sunshine hours day^{-1} (BSSH) and total rainfall (mm) were considered for study. The degree of association was calculated by using Karl Pearson's coefficient of correlation.

$$rxy = \frac{\text{Cov.}(X, Y)}{\sqrt{V(X)\,V(Y)}}$$

r_{xy} = Correlation coefficient between X and Y

Cov. (X, Y) = Covariance of X and Y

V(X) = Variance due to character X

V(Y) = Variance due to character Y

The significance of correlation coefficient (r) was tested by student's't' test with (n-2) degree of freedom (Snedecor and Cochran, 1956) at 5 % level of significance.

$$t = \frac{r\,(n-2)}{\sqrt{1-r^2}}$$

RESULTS AND DISCUSSION

Panicle study

The data (Table 1), revealed that, mango cultivar Kesar recorded maximum length of panicle (37.55 cm) which was at par with Alphanso (35.66 cm) and Amrapali (32.80 cm). The length of panicle was minimum (19.73 cm) in Sonpari which was at par with Totapuri (20.91 cm). The variation in length of panicles in mango varieties might be due to genetic composition and more specifically the physiological condition of the shoot on which panicle arise. These results are also in harmony with findings obtained by Azam *et al* (2018), Kumar *et al* (2018), Kishor *et al* (2019), and Indian *et al* (2020).

The maximum width of panicle (22.76 cm) was recorded in Kesar which was at par with Rajapuri (19.63 cm). Minimum width of panicle (14.27 cm) was recorded in Totapuri, which was at par with Amravati (16.46 cm), Alphonso (17.49 cm), Sonpari (16.76 cm) and Dashehari (16.91 cm). This variation in panicle width might be a result of interaction among the genetic composition of the varieties and climatic conditions. Similarly, Kishor *et al* (2019) and Indian *et al* (2020) reported that panicle width varied according to different mango cultivars.

Mango cv. Alphonso recorded maximum diameter of primary rachis (5.65 mm), which was at par with Kesar (5.60 mm), Rajapuri (5.18 mm), Sonpari (4.68 mm), Totapuri (4.64 mm) and Dashehari (4.62 mm). Significantly minimum diameter of primary rachis (3.91 mm) was recorded in Amrapali. Mango cv. Kesar recorded maximum number of spikelets panicle^{-1} (above 10 cm) (14.00), which was at par with Alphonso (10.95). Minimum number of spikelets panicle^{-1} (2.70) were recorded in Sonpari, which was at par with Totapuri (3.23), Dashehari (5.92) Amrapali (6.29) and (7.19). The variation in the diameter of primary rachis and number of spikelets panicle^{-1} might be due to their varietal character. The results are in line with findings reported by and Singh (2014) and Rajatiya *et al* (2018).

Correlation study

Correlation between panicle growth parameters and weather parameters for the effective time had been studied individually for the year 2019-20 (Table 2) and 2020-21 (Table 3).

Panicle length and breadth

During both the years correlations between length of panicle and climatic parameters were found non-significant. It was revealed that the climatic parameters were not affected length of panicles. These results are in accordance with Yadav (2016), Rajatiya *et al* (2018) and Sinha *et al* (2020).

During the year 2019-20 correlations between panicle breadth and climatic parameters were found non-significant. However, during 2020-21 panicle breadth was significantly positive correlated with minimum relative humidity (r = 0.85*) and total rainfall (r = 0.81*). Correlations for rest of all parameters were found non-significant.

Humidity raised due to rainfall might be the cause for promoting growth of panicle by providing

congenial conditions. These results are in accordance with Shu (1999), Yadav (2016), Rajatiya *et al* (2018) and Sinha *et al* (2020).

Diameter of primary rachis

During the year 2019-20, it was observed that, correlation between diameter of primary rachis and climatic parameters *viz.,* maximum temperature (r= -0.81*), minimum temperature (r= -0.92**) and bright sunshine hours (r= -0.91**) were significant and negatively correlated. However, in case of minimum relative humidity (r= 0.95**) it was significant and positively correlated. All other parameters recorded non-significant correlations. For the year 2020-21, correlation coefficient for minimum relative was significant and positively correlated (r = 0.82*), whereas, it was significantly negative correlated for wind velocity (r = -0.79*) and bright sunshine hours (r = -0.80*). For all other parameters correlations were found non-significant.

Thicker rachis has been a varietal character of Alphonso (V_2), Kesar (V_4) and Rajapuri (V_7). Panicles of these were developed during cooler months (Jan.). While, thinner rachis is a varietal character of Amrapali (V_3), Dashehari (V_5) and Totapuri (V_6), who developed their panicles during warmer climate (Feb.). Because of these varietal characters maximum temperatures and bright sunshine hours fail to produce positive correlations. These results were in harmony with correlations reported by Yadav (2016), Rajatiya *et al* (2018) and Sinha *et al* (2020).

Spikelets /panicle (above 10 cm)

During the year 2019-20, number of spikelets/ panicle (above 10 cm) were recorded significant and positive correlations with minimum relative humidity (r= 0.78*) and negative correlation with bright sunshine hours (r= -0.79*). For the year 2020-21 climatic factors failed to produce significant correlations.

It is often said that humidity enhances vigorous growth this principle might be applicable to positive correlation between number of spikelets/ panicle (above 10 cm) and humidity on one hand. While, on other hand, being a varietal character, branched rachis with more number of spikelets were produced in Kesar and Alphonso and whose panicles were developed during cooler months (Jan.). During this period comparatively humidity was more and sunshine hours were less than late flowering cultivars. Late flowering cultivars produced comparatively less number of spikelets *viz.,* Sonpari, Amrapali and Totapuri than earlier group. Due to these varietal characters all other climatic parameters might have failed to produce significant correlations. These results were in harmony with correlation study reported by Yadav (2016), Rajatiya *et al* (2018) and Sinha *et al* (2020).

CONCLUSION

Mango cv. Kesar recorded maximum panicle dimensions (length and breadth) and Number of spikelets/panicle (above 10 cm). Maximum primary rachis diameter was noticed in Alphonso. Panicle width and number of spikelets above 10 cm were significantly influenced by different climatic parameters. Climatic parameters failed to produce significant effect on panicle length, width and number of spikelets above 10 cm during both the years, first trial and second trial, respectively. However, correlations for rachis diameter were significant with different climatic parameters during both the years.

Table 1. Panicle parameters influenced by mango varieties (2019-20 & 2020-21)

Treatment	Inflorescence Density	Anthocynin coloration of rachis and spiklets	Length of panicle (cm)	Width of panicle (cm)	Diameter of primary rachis (mm)	Number of spikelets/ panicle (above 10 cm)
V_1 - Sonpari	Sparse	Medium	19.73	16.76	4.68	2.70
V_2 - Alphonso	Dense	Strong	35.66	17.49	5.65	10.95
V_3 - Amrapali	Sparse	Weak	32.80	16.46	3.91	6.96
V_4 - Kesar	Dense	Strong	37.55	22.76	5.60	14.00
V_5 - Dashehari	Medium	Absent	27.36	16.91	4.62	5.92
V_6 - Totapuri	Sparse	Medium	20.91	14.27	4.64	3.23
V_7 - Rajapuri	Dense	Medium	30.63	19.63	5.18	7.19
S.Em.±	-	-	2.31	1.21	0.31	1.52
C.D. at 5%	-	-	8.00	3.5	1.06	5.28

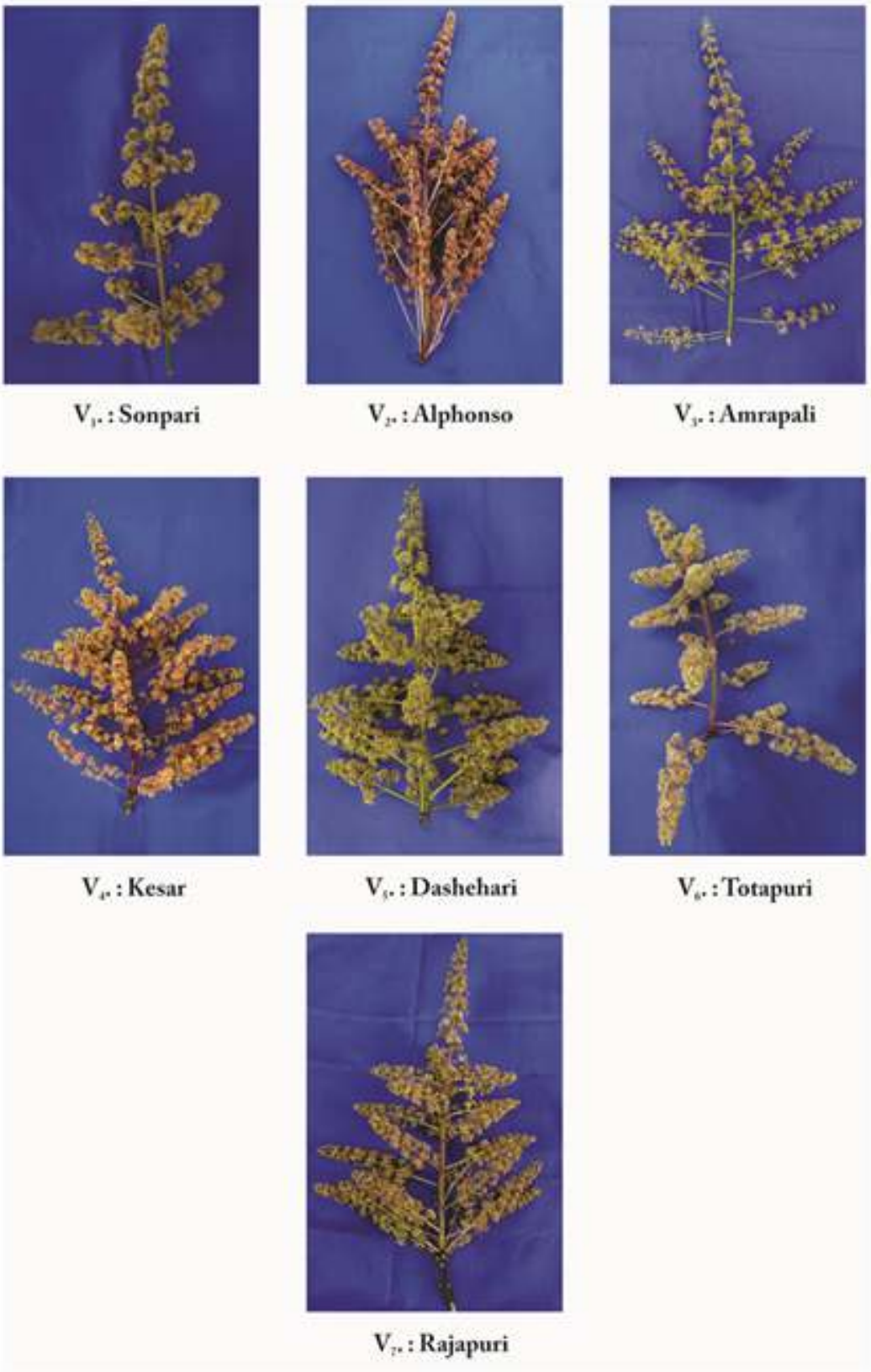

Plate: Comparison between mango varieties for panicle parameters

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V_2 - Alphonso	Dense	Strong	35.66	17.49	5.65	10.95
V_3 - Amrapali	Sparse	Weak	32.80	16.46	3.91	6.96
V_4 - Kesar	Dense	Strong	37.55	22.76	5.60	14.00
V_5 - Dashehari	Medium	Absent	27.36	16.91	4.62	5.92
V_6 - Totapuri	Sparse	Medium	20.91	14.27	4.64	3.23
V_7 - Rajapuri	Dense	Medium	30.63	19.63	5.18	7.19
S.Em.±	-	-	2.31	1.21	0.31	1.52
C.D. at 5%	-	-	8.00	3.5	1.06	5.28

Table 2. Correlation between panicle parameters and climatic parameters in mango varieties (2019-20)

Treatment	Length of panicle (cm)	Width of panicle (cm)	Diameter of primary rachis (mm)	Number of spikelets/ panicle (above 10 cm)	T_{max} (^{0}C)	T_{min} (^{0}C)	RH_{max} (%)	RH_{min} (%)	Wind velocity (km/hr)	BSSH
V_1 - Sonpari	18.63	14.27	4.34	2.40	30.03	14.05	86.28	43.42	1.66	8.33
V_2 - Alphonso	38.26	17.44	5.75	11.98	29.09	11.89	85.35	55.11	1.65	7.23
V_3 - Amrapali	33.11	16.71	3.94	6.48	33.69	15.93	83.59	40.70	0.66	8.66
V_4 - Kesar	37.99	20.13	5.32	15.73	29.17	11.90	85.61	53.04	1.61	7.53
V_5 - Dashehari	22.98	15.26	5.13	3.06	30.50	13.77	86.11	46.37	1.56	8.30
V_6 - Totapuri	18.22	14.38	4.31	3.38	30.88	14.68	84.78	42.85	1.50	8.39
V_7 - Rajapuri	31.06	16.93	5.16	8.39	29.35	12.02	85.33	52.52	1.59	7.64
Correlation coefficients		0.91**	0.56	0.91**	-0.16	-0.52	-0.28	0.68	-0.16	-0.67
			0.55	0.96**	-0.29	-0.59	-0.11	0.68	-0.01	-0.66
				0.64	-0.81*	-0.92**	0.49	0.95**	0.65	-0.91**
					-0.43	-0.69	-0.07	0.78*	0.13	-0.79*

Table 3.Correlation between panicle parameters and climatic parameters in mango varieties (2020-21)

Treatment	Length of panicle (cm)	Width of panicle (cm)	Diameter of primary rachis (mm)	Number of spikelets/ panicle (above 10 cm)	T_{max} (^{0}C)	T_{min} (^{0}C)	RH_{max} (%)	RH_{min} (%)	Wind velocity (km/ hr)	BSSH	Total rainfall (mm)
V_1 - Sonpari	20.83	19.26	5.02	3.00	31.13	12.78	89.78	52.21	2.71	8.55	0.00
V_2 - Alphonso	33.06	17.53	5.54	9.92	32.61	16.29	79.94	53.00	2.34	7.26	21.00
V_3 - Amrapali	32.50	16.21	3.87	7.44	33.96	14.31	85.71	39.66	2.89	8.75	0.00
V_4 - Kesar	37.11	25.39	5.88	12.28	31.04	15.05	86.85	59.46	2.27	6.95	39.00
V_5 - Dashehari	31.73	18.56	4.11	8.78	31.57	12.32	83.89	43.19	2.97	8.78	0.00
V_6 - Totapuri	23.61	14.15	4.97	3.08	32.09	12.74	83.36	41.83	3.05	8.66	0.00
V_7 - Rajapuri	30.20	22.32	5.20	6.00	30.97	15.60	86.16	59.66	2.39	6.92	39.00
Correlation coefficients		0.49	0.14	0.95**	0.17	0.60	-0.34	0.26	-0.51	-0.53	0.57
			0.56	0.54	-0.66	0.40	0.44	0.85*	-0.76*	-0.73	0.81**
				0.27	-0.55	0.54	-0.04	0.82*	-0.79*	-0.80*	0.73
					0.05	0.54	-0.32	0.32	-0.57	-0.53	0.54

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