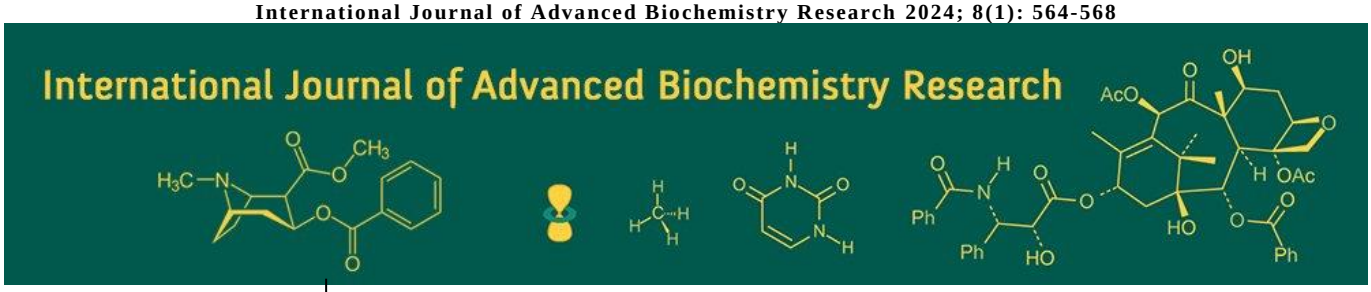

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Experimental study on the effect of weather factors, micronutrients, growth regulators, and polyamines on mango (*Mangifera indica* L.) yield and quality Cv. Kesar

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Abstract
Mango trees were sprayed with chemicals such as putrescine (0.1 mM), spermine (0.01 mM), triacontanol (750 ppm), NAA (25 ppm), CPPU (3 ppm), salicylic acid (100 ppm), $ZnSO_4$ (0.5%), and boron (0.5%) to investigate their effect on yield and quality. Treatment T7 (NAA 25 ppm + SA 100 ppm + $ZnSO_4$ 0.5%) had the highest fruit yield (27.68 MT ha^{-1}), longest fruit length (11.05 cm), largest fruit diameter (7.35 cm), weight (239.36 g), firmest (14.67 kg/cm^2), pulp weight (164.71 g), lowest acidity (0.24%), while maximum fruit volume (223.38 ml) recorded in treatment T14 (CPPU 3 ppm + SA 100 ppm + B 0.5%). The lowest yield and quality was noticed in treatment T_{19} (control). The correlation of weather parameters *viz*., maximum temperature range (28 °C to 43.9 °C) of both seasons showed significant correlation while, minimum temperature range (9.5 to 26.1 °C) exhibited deleterious effect on yield and quality traits. The influence of average maximum RH (35 to 81%) of both seasons showed negative but significant correlation. However, positive and significant correlation was found between maximum humidity and acidity content. The average minimum RH (8 to 43%) exhibited significant effects on mango cv. Kesar.

Keywords: Chemicals, mango, quality, weather, yield

Introduction
In India numerous cultivars of mango are cultivated with diversity of flavor and taste among them, Kesar has good consumer acceptance. The highest area is under cultivation of this variety in Marathwada region but it is noticed that, the mango growers are having problem of more fruit drop with poor yield and quality of fruits. Fruit drop is menace to low yield in mango trees.

Heavy fruit drop is an important factor contributing to low fruit yield in mango orchards and sometime only 0.1% of set fruit reach maturity. An exogenous application of various plant growth regulators seems to have good fruit retention, possibly due to the complex nature of the abscission phenomenon. Similarly, micronutrients play a key role in various enzymatic activities and synthesis of assimilating hormones. The flowering and fruit setting in mango is related to the weather patterns and environmental conditions (Makhmale *et al*., 2016) [1]. Climate change has been perceived as threat and has impact on mango production. Under tropical and subtropical climatic condition, floral induction is primarily driven by the intensity and duration of cool temperature. Continuous low temperature (diurnal maximum temperature <20 °C) induced flowering with large number flowers followed by low pollen viability, low fruit set, stenospermocarpy mango fruit and high fruit drop during early stage of fruit development. Cold snap at the time of flowering in year resulted in low fruit setting and lower production.

In light of above, the present investigation was undertaken with an objective to find out the effect of chemicals *viz*.,polyamines, growth regulators and micro-nutrients with weather parameters on yield and quality of mangoin cultivar Kesar.

Methodology

The present study was carried out on eleven years old mango trees of uniform growth, which were planted at 5×5 m distance at Central Nursery, Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani during the year 2019 and 2020. The experiment was laid out in Randomized Block Design (RBD) with two replications and nineteen treatments. The different chemicals were applied on the foliage at different stages *i.e.* Triacontanol at full bloom, pea and marble stage; NAA and Putrescine at full bloom and pea stage; CPPU, Salicylic acid and Zinc Sulphate at pea and marble stage; Spermine once at full bloom stage and Boron at full bloom and marble stage. The various yield and quality attributes were recorded during both years and data obtained on above variables were analyzed by analysis of variance method. Weather parameters *viz*., average temperature (°C) and relative humidity (%) were measured with the help of temperature and humidity meter and WBT-Dew point (Equinox EQ-321S) under the canopy of different treatments of mango trees twice in a day from flowering to maturity of fruits and average temperature and relative humidity were worked out on the basis of meteorological weeks. The 19 meteorological weeks during flowering to maturity of fruits were taken into consideration for determining the association of weather with mango and were correlated using statistical package for social science suggested by Panse and Sukhatme, 1985 [2].

Results and Discussion

Influence of different chemicals on yield and quality of mango

The findings related to the influence of different chemicals on yield and quality as shown in Table 1 revealed that maximum fruit yield per hectare was obtained in treatment T_7 (27.68 MT) which was 158.45 percent increased over control and was found to be statistically at par with treatment T_{14} (26.25 MT) while the minimum yield per hectare (10.71 MT) was recorded in treatment T_{19} (control). The beneficial effect of chemicals in increasing fruit yield might be due to the combined application of salicylic acid with growth regulators and micronutrients like zinc and boron which can be attributed to increased photosynthetic activity in leaves and translocation of more photo-assimilates to fruits results in higher yield. These results are in line with the findings of Rahmani *et al*.,2017 [3]. The highest fruit length and diameter was observed in treatment T_7 (11.05 and 7.35 cm) which was statistically at par with treatments T_{14} (10.94 and 7.24 cm) and T_{13}(10.82 and 7.14 cm) while the lowest fruit length (8.76 and 5.85 cm) respectively was recorded in treatment T_{19} (control). The best result pertaining to fruit length and diameter might be due to the combine application of different chemicals under this study. The auxin and micronutrients accelerated the growth and size of fruit by elongation and enlargement. These results are line up with the findings of Tsomu and Patel, 2019 [4]. The beneficial effects of salicylic acid on fruiting of Kesar mango trees might be attributed to its positive action ion enhancing cell division, the biosynthesis of carbohydrates and plant pigments (Ahmed, *et al*., 2015) [5]. CPPU increases cell size and is also responsible for the production and transport of plant sugars that increases the size of fruit. Similar results were also reported by Kulkarni *et al*., 2017 [6] and Rahmani *et al*.,2017 [3] in mango.The significant highest fruit weight was also recorded in treatment T_7 (239.36 g) which was 61.12 percent increased over control and was found to be statistically at par with treatments T_{14} (232.93 g) and T_{13} (232.63 g). The best result pertaining to fruit weight might be due auxin as it accelerate the fruit growth and fruit size by elongation and enlargement. These results are line up with findings of Naleo *et al.* 2018 [7]. Appraisal of fruit volume data revealed that, highest fruit volume was recorded in treatment T_{14} (223.38 ml) which was statistically at par with T_{13} (221.15 ml) and T_7 (220.49 ml) whereas, the lowest fruit volume (137.14 ml) was recorded in treatment T_{19} (control). The increase in fruit volume might be attributed to stimulation of cell division by CPPU. Increased fruit size also attributed to increased fruit mass and volume due to increased cell division and fruit expansion. These findings are supported by the results obtained by Bhat *et al*. 2012 [8] in grapes. The beneficial effects of salicylic acid in combination with NAA and zinc sulphate on fruit volume might be attributed to its positive action ion enhancing cell division, the biosynthesis of carbohydrates and plant pigments (Ahmed, *et al*., 2015) [5]. The highest fruit firmness was noted in treatment T_7 (14.67 kg/cm^2) which was statistically at par with T_{14} (14.31 kg/cm^2). However, the lowest fruit firmness was recorded in treatment T_4 (10.28 kg/cm^2). Improved fruit firmness might be due to synthesis of auxin in plants as it increases the physiological activities in plant. These findings are supported by Naleo *et al*., 2018 [7]. Similarly, highest pulp weight was also obtained in treatment T_7 (164.71 g) which was 136.99 percent increased over control and statistically at par with treatments T_{14} (160.25 g) and T_{13} (157.03 g) while the lowest (69.50 g) was recorded in treatment T_{19} (control). It might be due NAA as it is responsible for synthesis of auxin in plants; it increases the physiological activities leading to increased pulp weight of fruits. The obtained results are in harmony with the findings of Tsomu and Patel, 2019 [4]. Significantly highest TSS was recorded in treatment T_7 (19.66%) which was 28.19 percent increased over control and was found to be statistically at par with T_{14} (19.41%) while the lowest TSS (15.34%) was recorded in T_{19} (control). An increase in TSS could be attributed to higher solutes as a result of enhanced mobilization of carbohydrates in these treatments. This might be due to promoted effect of salicylic acid on improving the biosynthesis and translocation of plant pigment and sugar (Muthulakshmi and Lingakumar, 2017 [9] and Bhati and Yadav, 2003) [10]. The lowest acidity (0.24%) was noticed in treatment T_7 which was at par with treatments T_{14} (0.24%), T_{13} (0.25%) and T_{15} (0.25%). However, the highest acidity (0.33%) was recorded in T_{19} (control). Decrease in acidity might be due to the reason mentioned under TSS. The highest ascorbic acid content was found in T_7 (46.14 mg 100 g^{-1}) which was 17.97 percent increased over control and was at par with treatments T_{14} (45.40 mg 100 g^{-1}) and T_{13} (45.19 mg 100 g^{-1}) whereas, lowest (39.12 mg 100 g^{-1}) observed in T_{19} (control). The present findings are supported by Waqas *et al*., 2012 [11].

Association of weather factors with yield and quality attributes of mango

In order to find out the degree of association of weather parameters with yield and quality contributing traits of mango, the multiple correlation matrix were estimated by analyzing the data of Temperature $_{(Min/Max)}$ and Relative Humidity $_{(Min/Max)}$ which was noted during the period of full

bloom stage to maturity of fruits in both the seasons and average temperature and Relative Humidity (RH) were worked out on the basis of meteorological weeks of the relative years. The nineteen meteorological weeks started from 2nd to 20th week each during both the years were taken into consideration for estimation of multiple correlation matrix.

The significant correlation of weather parameters with yield and quality traits of mango during two consecutive years are presented in Table 2 and 3 respectively.

A. Yield (MT ha^{-1}): The perusal of data pertaining to yield per hectare in the year 2019-20 revealed that, there was positive and significant correlation between T_{Max} (0.373). The data obtained during 2020-21 showed that, RH_{Min} had negative but significant correlation (-0.520) with fruit yield. T_{Max} had positive and significant correlation while RH_{Max} had negative and non-significant correlation with yield, this is in agreement with the findings of Kumar *et al*., 2014 [12].

B. Fruit length (cm): In the year 2019-20, positive and significant correlation between T_{Max} (0.379) and T_{Min} (0.378) with fruit length and negative but significant correlations (-0.456 and -0.477) with RH_{Max} and RH_{Min} respectively was observed. In 2020-21, there was positive and significant correlation between T_{Max} (0.394) with fruit length. Further it showed negative but significant correlations (-0.444 and -0.550) with RH_{Max} and RH_{Min} respectively. The maximum temperature is found to be congenial for increasing fruit length in mango which might be due to improved photosynthetic efficiency leading to synthesis of more photo assimilates for the development of fruits. This is in conformity with the results reported by Shu, 1999 [13].

C. Fruit diameter (cm): The positive and significant correlation of T_{Max} (0.461) and T_{Min} (0.401) with fruit diameter was noticed while, RH_{Max} and RH_{Min} had negative but significantly correlation (-0.433 and -0.447) respectively, with fruit diameter in 2019-20. However, during 2020-21, RH_{Min} had negative but significant correlation (-0.428) with this parameter. High temperature could have a positive effect on fruit diameter because of improved photosynthesis. The present findings are in accordance with Normand and Legave, 2015 [14].

D. Fruit weight (g): The positive and significant correlations (0.466 and 0.460) with T_{Max} and T_{Min} respectively, while RH_{Max} and RH_{Min} noted negative but significant correlations (-0.531 and -0.473) respectively, with fruit weight during the year 2019-20 as shown in Table 2. While, T_{Max} had positive and significant correlation (0.512) with fruit weight. However, RH_{Max} and RH_{Min} (-0.396 and -0.625) respectively, were exhibited negative and significant correlation during 2020-21 as shown in Table 3. Among other weather factors, temperature seems to be a quite decisive single factor on the fruit weight of mangoes (Normand and Legave, 2015) [14].

E. Fruit volume (ml): The data of fruit volume during the year 2019-20 revealed that T_{Max} and T_{Min} had positive and significant correlations (0.447 and 0.442) respectively, while RH_{Max} and RH_{Min} had negative but significant correlations (-0.518 and-0.468) respectively, with fruit volume. Similar trend was noticed during the year 2020-21, where T_{Max} and T_{Min} had positive and significant correlations (0.576 and 0.382) respectively, while RH_{Max} and RH_{Min} showed negative but significant correlations (-0.435 and-0.651) respectively. The present findings are in accordance with Normand and Legave, 2015 [14].

F. Fruit firmness (kg/cm^2): In the year 2019-20, T_{Max} and T_{Min} showed positive and significant correlations (0.488 and 0.462) respectively, while RH_{Max} and RH_{Min} noted negative but significant correlations (-0.474 and -0.433) respectively with fruit firmness. Data of the year 2020-21 revealed that, T_{Max} had positive and significant correlation (0.594) while RH_{Max} and RH_{Min} noted negative but significant correlations (-0.451 and -0.730) respectively with fruit firmness. The temperature might played role in synthesis of growth promoter hormone (auxin) and also accumulation of calcium in fruit tissues which is directly associated with maintenance of fruit firmness. However, the perusal of the literature available fails to throw light on these findings.

G. Pulp weight (g): The T_{Max} and T_{Min} had positive and significant correlations (0.489 and 0.449) respectively, while RH_{Max} and RH_{Min} noted negative but significant correlations (-0.494 and -0.471) respectively during the year 2019-20. However, in the year 2020-21, T_{Max} showed positive and significant correlations (0.479) while RH_{Min} showed negative but significant correlation (-0.602) with pulp weight.The increase in pulp content in mango fruits might be due to maximum temperature during fruit development stage in both the seasons. However, the perusal of the literature available fails to throw light on these findings.

H. Total Soluble Solids (%): It was observed from the data of the year 2019-20 that, the T_{Max} and T_{Min} had positive and significant correlations (0.531 and 0.528) respectively with total soluble solids (TSS), while RH_{Max} and RH_{Min} showed negative but significant correlation (-0.592 and-0.538) respectively, with TSS. The data of the year 2020-21 revealed that, T_{Max} had positive and significant correlation (0.570), while RH_{Max} and RH_{Min} showed negative but significant correlation (-0.507 and-0.668) respectively, withTSS (Normand and Legave, 2015) [14]. Regarding negative impact of high relative humidity on quality attributes in general and TSS of mango in particular in the present investigation, Makhmale *et al*., 2016 [1] reported that warm and hot climate with low relative humidity is congenial for mango.

I. Acidity (%): The T_{Max} (-0.477) and T_{Min}(-0.478) exhibited negative and significant correlation with juice acidity while, it showed positive and significant correlation (0.539 and 0.489) with RH_{Max} and RH_{Min} respectively in the year 2019-20. Similar trend was also noticed during the year 2020-21, T_{Max} (-0.487) had negative and significant correlation, while, positive and significant correlations (0.422 and 0.652) were found between RH_{Max} and RH_{Min} respectively, with juice acidity percent. The reduction in acidity due to temperature could be attributed to enhanced mobilization of carbohydrates and improvement in the biosynthesis and translocation of plant pigment and sugar. However, the perusal of the literature available fails to throw light on these findings.

J. Ascorbic acid content (mg 100 g^{-1}): In the year 2019-20, positive and significant correlation was found

between all weather parameters under study *i.e.* T_{Max} (0.440), T_{Min} (0.410), RH_{Max} (0.429) and RH_{Min} (0.414) with ascorbic acid. However, the data of 2020-21 indicated that, T_{Max} (0.462) had positive and significant correlation while, RH_{Min}(-0.535) noted negative but significant correlation with ascorbic acid content.The results obtained in the present study revealed that temperature is most decisive factor for increment of ascorbic acid content which could be due to improved biosynthesis and translocation of plant pigments. However, the perusal of the literature available fails to throw light on these findings.

Table 1: Effect of chemicals on yield and quality traits of mango Cv. Kesar

Treat. No.	Pooled mean for the years 2019 and 2020									
	Yield (MT ha^{-1})	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Fruit volume (ml)	Firmness (kg/cm^2)	Pulp wt. (g)	TSS (%)	Acidity (%)	Ascorbic acid (mg 100 g^{-1})
T_1	13.36 (24.72)	9.83	6.53	175.65 (18.24)	161.88	11.47	98.41 (41.60)	16.47 (7.37)	0.31	40.42 (3.34)
T_2	14.52 (35.53)	9.59	6.44	180.07 (21.22)	166.35	11.50	100.39 (44.44)	15.59 (1.60)	0.31	39.47 (0.89)
T_3	17.09 (59.45)	9.29	6.19	170.59 (14.83)	158.94	11.77	97.00 (39.57)	16.26 (5.95)	0.30	40.99 (4.78)
T_4	11.50 (7.40)	9.13	5.92	158.38 (4.93)	146.49	10.28	84.80 (22.01)	15.40 (0.39)	0.32	40.60 (3.80)
T_5	11.69 (9.10)	9.22	6.38	154.73 (4.16)	142.61	10.53	84.19 (21.13)	16.16 (5.35)	0.32	40.63 (3.87)
T_6	11.67 (8.94)	9.11	6.37	153.37 (3.24)	144.05	10.49	86.19 (24.01)	15.50 (1.04)	0.32	39.32 (0.51)
T_7	27.68 (158.45)	11.05	7.35	239.36 (61.12)	220.49	14.67	164.71 (136.99)	19.66 (28.19)	0.24	46.14 (17.97)
T_8	17.90 (67.13)	10.38	6.74	196.53 (32.30)	180.17	12.79	112.86 (62.38)	17.55 (14.41)	0.26	40.23 (2.85)
T_9	18.62 (73.88)	10.04	6.56	190.23 (28.06)	174.55	13.68	116.01 (66.91)	17.09 (11.39)	0.28	44.45 (13.63)
T_{10}	16.58 (54.69)	9.88	6.51	185.92 (25.15)	168.45	12.77	108.11 (55.55)	16.63 (8.39)	0.27	39.88 (1.94)
T_{11}	17.50 (63.35)	9.81	6.46	184.06 (23.90)	173.63	13.53	112.48 (61.83)	17.40 (13.43)	0.28	43.62 (11.52)
T_{12}	17.02 (58.87)	8.89	6.40	180.74 (21.67)	166.62	12.50	108.09 (55.51)	16.20 (5.61)	0.29	39.40 (0.72)
T_{13}	25.26 (135.90)	10.82	7.14	232.63 (56.60)	221.15	13.70	157.03 (125.94)	18.92 (23.32)	0.25	45.19 (15.53)
T_{14}	26.25 (145.05)	10.94	7.24	232.93 (56.80)	223.38	14.31	160.25 (130.57)	19.41 (26.48)	0.24	45.40 (16.07)
T_{15}	18.31 (70.94)	10.51	6.78	221.36 (49.01)	208.84	13.67	142.70 (105.32)	18.77 (22.36)	0.25	44.12 (12.80)
T_{16}	17.21 (60.69)	10.45	6.89	205.36 (38.24)	189.72	13.11	129.92 (86.93)	18.40 (19.95)	0.26	43.47 (11.13)
T_{17}	18.39 (71.66)	10.51	6.96	215.44 (45.03)	202.37	13.99	135.10 (94.39)	18.60 (21.27)	0.25	43.81 (12.00)
T_{18}	16.10 (50.37)	10.33	6.64	197.47 (32.93)	183.35	13.09	118.61 (71.01)	18.08 (17.83)	0.27	43.10 (10.19)
T_{19}	10.71	8.76	5.85	148.55	137.14	10.49	69.50	15.34	0.33	39.12
S.E.m ±	0.64	0.17	0.09	2.51	2.46	0.22	3.30	0.19	0.01	0.47
C.D.at 5%	1.82	0.48	0.25	7.13	7.00	0.64	9.37	0.54	0.02	1.32

(Figures in parenthesis indicates the values in percent over control)

Table 2: Correlation of weather parameters with yield and quality attributes of mango (2019-20)

	A	B	C	D	E	F	G	H	I	J	T_{Max}	T_{Min}	RH_{Max}	RH_{Min}
A	1													
B	0.857	1												
C	0.900	0.915	1											
D	0.924	0.961	0.937	1										
E	0.928	0.961	0.934	0.998	1									
F	0.851	0.847	0.864	0.894	0.889	1								
G	0.938	0.949	0.958	0.982	0.984	0.897	1							
H	0.874	0.948	0.936	0.964	0.962	0.893	0.962	1						
I	-0.880	-0.889	-0.893	-0.942	-0.941	-0.943	-0.925	-0.951	1					
J	0.825	0.870	0.850	0.853	0.860	0.832	0.906	0.905	-0.810	1				
T Max	0.372**	0.379**	0.462*	0.466*	0.447*	0.488*	0.489*	0.531*	-0.477*	0.440*	1			
T Min	0.334	0.378**	0.401**	0.460*	0.442*	0.462*	0.449*	0.528*	-0.478*	0.410**	0.959	1		
H Max	-0.364	-0.456*	-0.433*	-0.531*	-0.518*	-0.474*	-0.494*	-0.592*	0.539*	-0.429**	-0.887	-0.927	1	
H Min	-0.335	-0.477*	-0.447*	-0.473*	-0.468*	-0.433*	-0.471*	-0.538*	0.489*	-0.414**	-0.785	-0.721	0.806	1
* Significant at 5%; **Significant at 10%														

The average temperature and humidity range during 19 meteorological weeks of the year 2019-20 is as below.
T_{Min} = 9.5 °C to 26.1 °C
RH_{Min} = 08% to 37%
T_{Max} = 29.4 °C to 43.9 °C
RH_{Max} = 35% to 77%

Table 3: Correlation of weather parameters with yield and quality attributes of mango (2020-21)

	A	B	C	D	E	F	G	H	I	J	T_{Max}	T_{Min}	RH_{Max}	RH_{Min}
A	1													
B	0.786	1												
C	0.835	0.925	1											
D	0.910	0.906	0.892	1										
E	0.898	0.875	0.854	0.985	1									
F	0.878	0.853	0.784	0.921	0.907	1								
G	0.930	0.889	0.901	0.991	0.979	0.902	1							
H	0.845	0.934	0.881	0.932	0.931	0.904	0.936	1						
I	-0.849	-0.919	-0.853	-0.928	-0.890	-0.940	-0.918	-0.915	1					
J	0.800	0.799	0.692	0.819	0.842	0.844	0.829	0.889	-0.797	1				
T Max	0.350	0.394**	0.278	0.512*	0.576*	0.594*	0.479*	0.570*	-0.487*	0.462*	1			
T Min	0.111	0.160	0.033	0.297	0.382**	0.362	0.257	0.359	-0.236	0.315	0.905	1		
H Max	-0.109	-0.444*	-0.253	-0.396**	-0.435*	-0.451*	-0.339	-0.507*	0.422**	-0.348	-0.859	-0.826	1	
H Min	-0.520*	-0.550*	-0.428*	-0.625*	-0.651*	-0.730*	-0.602*	-0.668*	0.652*	-0.535*	-0.904	-0.654	0.741	1
* 5% level of significance; **10% level of significance														
A-Yield (MT/ha); B- Fruit length (cm); C- Fruit diameter (cm); D- Fruit weight (g); E- Fruit Volume (ml); F- Fruit Firmness (Kg/cm^2);G-Pulp weight (g); H- TSS (%); I- Acidity (%); J- Ascorbic acid (mg/100 g)														

The average temperature and humidity range during 19 meteorological weeks of the year 2020-21 is as below.

T_{Min} = 12.3 °C to 24.9 °C

RH_{Min} = 17% to 43%

T_{Max} = 28.0 °C to 41.4 °C

RH_{Max} = 46% to 81%

Conclusion

It can be concluded that, the foliar application of NAA 25 ppm + Salicylic acid 100 ppm + $ZnSO_4$ 0.5% at three distinct stages was found significantly superior over rest of the treatments under study for enhancing yield and quality of mango cv. Kesar. Pertaining to the effect of weather parameters, high temperature had beneficial effects on most of the yield and quality attributes of mango whereas, low temperature exhibited less beneficial or deleterious effects during both seasons. The high humidity found to have deleterious effect while, low humidity exhibited beneficial effect on yield and quality of mango.

References

1. Makhmale S, Bhutada P, Yadav L, Yadav BK. Impact of climate change on phenology of mango–The case study. Ecol. and Environ. Cons. 2016;22:127-132.
2. Panse VS, Sukhatme PV. Statistical methods for Agricultural Workers, (4thEdn.) Indian Council of Agricultural Reasearch, Publication, New Delhi; c1985.
3. Rahmani N, Ahlawat TR, Kumar S, Mohammadi NK. Improving productivity in mango (*Mangifera indica* L.) cv. Kesar through foliar sprays of silicon and salicylic acid. Int. J. Chem. Studies. 2017;5:1440-1443.
4. Tsomu T, Patel HC. Effect of foliar spray of PGR's and micronutrients on yield and physical parameters of mango cv. Mallika. Int. J Chem. Studies. 2019;7:4968-4973.
5. Ahmed FF, Mansour AEM, Merwad MA. Physiological studies on the effect of spraying SA on fruiting of Sukkary mango trees. Int. J Chem. Tech. Res. 2015;8:2142-2149.
6. Kulkarni SS, Patil SS, Magar SD. Effect of plant growth regulators on yield and quality of mango (*Mangifera indica* L.) cv. Kesar. J Pharmacog. Phytochem. 2017;6:2309-2313.
7. Naleo S, Akali S, Maiti CS. Effect of plant growth regulators and packaging on flowering, fruit quality and shelf life in mango cv. Amrapali. J Exp Agric Int., 2018;20:1-8.
8. Bhat ZA, Bhat JA, Rashid R, Rather JA, Rehman Haseeb UR.Impact of new generation growth regulators (BRs and CPPU) on quality parameters of grape cv. Tas-A- Ganesh.VEGETOS. 2012;25:307-314.
9. Muthulakshmi S, Lingakumar K. Role of salicylic acid (SA) in plants– A review. Int. J Appl. Res., 2017;3:33-37.
10. Bhati SB, Yadav PK. Effect of foliar spray of urea and NAA on quality of ber (*Ziziphus mauritiana* L.) cultivar Gola.Har. J Hort. Sci. 2003;32:32-33.
11. Waqas A, Tahir FM, Rajwana IA, Raza SA, Asad HU. Comparative evaluation of plant growth regulators for preventing premature fruit drop and improving fruit quality parameters in 'Dasehri' mango. Int. J Fruit Sci. 2012;12:372-389.
12. Kumar M, Ponnuswami V, Ramesh Kumar S, Arumugam V. Correlation between weather and yield attributes of mango. Res. Environ. Life Sci. 2014;7:187-190.
13. Shu ZH. Effect of temperature on the flowering biology and fertilization of mangoes (*Mangifera indica* L.). App Hort.1999;1:79-83.
14. Normand N, Lauri PÉ, Legave JM. Climate change and its probable effects on mango production and cultivation. Proceedings of Xth International Mango Symposium, Acta Horticulturae. 2015;5:1075-1079.