



EFFECT OF GA₃ AND BA ON FRUIT WEIGHT, QUALITY AND RIPENING OF 'ROSE SCENTED' LITCHI

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ABSTRACT: An attempt was made to study the effect of GA₃ and BA on ripening of litchi cultivar Rose Scented. In this attempt, KNO₃ (4%) was sprayed at 1 cm size of panicle in the first week of February. However, other treatments viz. GA₃ (20, 40 ppm) and BA (20, 40 ppm) were applied two weeks before expected date of harvest (on 15th May). KNO₃ (4%) advanced the harvesting date only for 2 days in comparison to control. GA₃ 20 and 40 ppm delayed the harvest date for 2 and 5 days, respectively while BA 20 ppm and 40 ppm delayed the harvest date for 5-6 days. In all the treated trees, fruit weight was found to be more than 21g as compared to control. Higher fruit quality attributes were recorded with GA₃ (40 ppm) followed by GA₃ 20 ppm over other treatments. Reduced fruit cracking was also observed in trees which were sprayed with GA₃ and BA.

Keywords : GA₃, BA, litchi, quality, ripening.

Uttarakhand is one of the most popular states of the country known for its quality litchi production. The litchi industry in Uttarakhand is based on one major cultivar, the 'Rose Scented'. Its harvesting period is quite short, 7 to 10 days. The availability of fresh litchi fruits in the market may be extended for another few days by utilizing other genotypes available in the litchi. However, much scope is not there as available genotypes differ little with regard to their maturity period (Ray and Sharma, 9). Two pronged strategy may be employed to solve the problem *i.e.*, either advancing the date of harvest or delaying the date of harvest.

Still, there is no commercial method to be used for either advancing or delaying the harvesting time of litchi and thus extending the harvesting and marketing season. The motive of this study was to test methods for extending harvesting period of litchi. An alternative approach to induce early flowering and fruiting by using KNO₃ has been successfully used in mango (Kumar *et. al.*, 7). GA₃ has been found to offer suitable means of controlling ripening process in litchi (Ray and Sharma, 9) and in other fruit crops (Dilley, 4 and Lavon *et. al.*, 8). Evidence suggests that cytokinins retards sugar accumulation and pigmentation in

litchi fruits (Wang *et. al.*, 11). However, little information is available on use of KNO₃, GA₃ and BA in 'Rose Scented' litchi with regard to their effect on fruit yield, quality and ripening. The objective of this study was to determine the effect of KNO₃, GA₃ and BA on 'Rose Scented' litchi fruit maturity, size and quality.

MATERIALS AND METHODS

The experiment was carried out in 2007 and 2008 at HRC, Patharchatta, G.B.P.U.A&T., Pantnagar on 20 year old plants of litchi cv. Rose Scented, spaced at 10 x 10 m and maintained under uniform cultural practices. The experiment was laid out in a randomized block design with three replications. All the treatments were applied after fruit set except 4% KNO₃ (T₁), which was sprayed at 1 cm panicle stage in the month of February. GA₃ at 20 ppm (T₂), 40 ppm (T₃) and BA (6-Benzyl adenine) at 20 ppm (T₄), 40 ppm (T₅) were sprayed only once, on 15th May *i.e.* 2 week before from expected date of normal harvest. Teepol (2 ml/l) was added to the solution as wetting agent. There were total 6 treatments including control (T₆). All treatments were applied to separate trees.

Randomly 10 panicles in each direction of the tree were selected in each treatment for recording

Table 1: Effect of treatments on harvest advancement/delay and fruit quality of litchi cv. Rose Scented.

Treatment	Days taken to maturity	Harvest*(day)		Fruit cracking (%)	Fruit weight (g)	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100 g)	Total sugar (%)
		Advancement	Delay						
T ₁ (4% KNO ₃)	58.33	2.82	-	10.77	22.20	20.52	0.52	27.99	13.43
T ₂ (GA ₃ 20 ppm)	63.00	-	1.85	7.43	22.25	21.00	0.63	28.56	13.58
T ₃ (GA ₃ 40 ppm)	66.85	-	5.70	6.13	22.30	22.15	0.60	28.83	14.25
T ₄ (BA 20 ppm)	66.00	-	4.85	7.99	22.31	21.75	0.61	28.53	13.02
T ₅ (BA 40 ppm)	67.00	-	5.85	7.93	22.24	21.40	0.66	28.92	13.20
T ₆ (Control)	61.15	-	-	12.71	19.06	18.63	0.55	25.84	12.52
CD (P=0.05)	1.84			3.85	1.03	1.26	0.045	NS	0.34

* Harvest advancement/delay was counted by considering the date of harvest of control plants

data on fruit cracking, fruit weight, TSS, acidity ascorbic acid, total sugar and days taken to maturity. The fruits were considered to be ripe when they developed a bright pinkish-red blush with flattened tubercles (Gaur and Bajpai, 6). TSS was determined by using ERMA hand refractometer and acidity, recorded as malic acid, by titration of the juice with 0.1 N NaOH using phenolphthalein as the indicator. For estimating ascorbic acid, the fresh juice to which 4% metaphosphoric acid as stabilizing reagent had been added was titrated against 2:6 dichloro-endo-phenol dye solution.

Reducing sugars were determined by titrating the juice with Fehling's solutions A and B (standardized) using methylene blue as indicator. For determining total sugars, the juice was subjected to acid hydrolysis and total sugars were estimated by the method described for reducing sugars. The results were analyzed statistically for each year and ultimately the pooled estimates for both the years were worked out.

RESULTS AND DISCUSSION

In general, all the treatments except T₁ (4% KNO₃) and delayed ripening and thus extended the harvesting period in litchi cv. Rose Scented. However, treatments T₁ advanced the harvest

period by 2 days as compared to control (Wang *et al.*, 11). Significantly fruit cracking was reduced by all concentrations of GA₃ and BA in comparison to other treatments.

Spray of GA₃ at 40 ppm delayed harvesting by 6 days as compared to control with reduced fruit cracking, as well as acidity and with improved fruit weight, TSS, ascorbic acid and total sugars. Increase in fruit weight with enhanced fruit quality attributes and harvest delay in litchi with exogenous application of GA₃ has been reported earlier by Ray and Sharma (9) in litchi. Enhanced fruit weight and other physico-chemical attributes were observed by spray of GA₃ @ 5 to 10 mg/l in 'Yu Her Pau' litchi (Chang and Lin, 2). Gibberellic acid (GA₃) applied as a foliar spray during colour break prolonged on tree storage of citrus has also been reported (El-Otmani *et al.*, 5).

The harvest delay resulting from BA at 40 ppm was 5.5 days which is comparable to that gained with the use of gibberellic acid 40 ppm. Fruit quality attributes of BA treated fruits was at par with GA₃ treated fruits. There is little information concerning the influence of cytokinins on fruit weight, quality and prolonged date of harvest in litchi. Dhua *et al.* (3) found that application of kinetin (25 mg/l) to litchi trees after

25 days of fruit set increased the fruit weight and delayed development of fruit colour due to presence of higher chlorophyll content in the peel. Delayed maturity with 6-Benzyl adenine (BA) as observed during present investigation corroborated the finding of Bayer (1) and Wang *et al.* (11). Cytokinin either inhibit or delay the colour changes in litchi fruit green to red associated with ripening though without influencing other changes markedly also supports the earlier finding of Wang *et al.* (11).

REFERENCES

1. Beyer, Jr. E.M. (1976). A potential inhibitor of ethylene action in plants. *Plant Physiol.*, **58**: 268-271.
2. Chang, J.C. and Lin, T.S. (2006). GA₃ increase fruit weight in 'Yu Her Pau' litchi. *Scientia Hort.*, **108**:442-443.
3. Dhua, R.S., Roychoudhury, R., Kabir, J. and Ray, S.K.D. (2005). Staggering the litchi fruit harvest. *Acta Hort.*, **665**:347-353.
4. Dilley, D.R. (1969). Hormonal control of fruit ripening. *HortScience*, **4**: 111-114.
5. El-Otmani, M., Abdellah Ait M Berk and Coggins, C.W., Jr. (1990). GA₃ and 2, 4-D prolong on-tree storage of citrus in Morocco. *Scientia Hort.*, **44**: 241-249.
6. Gaur, G.S. and Bajpai, P.N. (1977). Maturity standards for litchi fruits *Litchi chinensis* Sonn. Cv. Calcuttia. *Prog. Hort.*, **9**:11-17.
7. Kumar, P.S., Reddy, Y.V. and Hari, D.S. (2003). Effect of foliar spray of chemicals on flowering and fruiting of shoots emerging after pruning on mango (*Mangifera indica* L.) cv. Baneshan. *South Indian Hort.*, **51**(1-6): 7-11.
8. Lavon, R., Bar Akiva, A., Shapchisky, S., Cohen, E., Shalon, Y. and Brosh, P. (1982). Prolonging the harvesting season of *Minneola tangelo* fruits by spraying with nutrients and growth substances. *Hassadeh.*, **63**: 492-497.
9. Ray, P.K. and Sharma, S.B. (1986). Delaying litchi harvest by growth regulator or urea. *Scientia Hort.*, **28**: 93-96.
10. Wang, H.C., Huang, H.B. and Hung, X.M. (2007). Differential effects of abscisic acid and ethylene on the fruit maturation of *Litchi chinensis* Sonn. *Plant Growth Regul.*, **52**(3): 189-198.
11. Wang, H.C., Hung, X.M., Hu, G.B., Yang, Z.Y. and Huang, H.B. (2005). A comparative study of chlorophyll loss and its related mechanism during fruit maturation in the pericarp of fast and slow, degreening litchi pericarp. *Scientia Hort.*, **106**:247-257.