



Short communication

Effect of Ethrel® on flowering, sex-expression and yield in cashew

M.S. Gawankar¹, R.D. Sawale, S.N. Pawar and S.A. Chavan

Regional Fruit Research Station
Vengurle - 416 516, India
E-mail: gawankarms@yahoo.co.in

ABSTRACT

A field trial was conducted at Regional Fruit Research Station, Vengurle, Dist. Sindhudurg, (Maharashtra) to assess the efficacy of Ethrel® in relation to flowering behavior and yield enhancement in cashew on seven year old Cashew trees of Vengurle -7 variety during 2008-09. Three sprays of Ethrel® @ 100 ppm, 200 ppm and 400 ppm along with water spray were given before flushing, after flushing and during fruit-set. Control consisted of no. spray. Among treatments, Ethrel® @ 100 ppm significantly increased number of flowering panicles m⁻² (12.0), number of perfect flowers per panicle (52.8), fruit-set m⁻² (28.8), number of nuts per panicle (2.9) and yield tree⁻¹ (1.51 kg tree⁻¹) than control and water spray. Thus, lower concentration of Ethrel® had a beneficial effect on cashew.

Key words : Cashew, Ethrel®, foliar spray, sex ratio, nut yield

Among the agricultural commodities exported from India, cashew held the fifth position contributing 0.35% of the total export earnings of the country in 2007-08 (Pillai, 2008). The productivity of cashew in India is moderate. As suggested by Bhat *et al* (2007), keeping in view the changing global scenario, there is a need to produce cashew at an internationally competitive price by reducing the cost of production and increasing production per unit area. Maharashtra now ranks first in both production and productivity of cashew in the country.

The average productivity in the state of Maharashtra is 1.5 t ha⁻¹ against a national average of 800 kg ha⁻¹. This is due to a strong research back-up and development of high yielding, bold-type hybrid varieties by Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli, and efforts made by extension officers of the state department at transfer of technologies and in popularizing the varieties developed. However, there is still scope for increasing productivity to 2.5 t ha⁻¹ with some refinements in management practices. Among the various factors influencing cashew yield, the narrow sex ratio is of primary importance. Therefore, growth regulators are gaining importance in cashew cultivation for overcoming problems associated with fruit set, development and, final retention. Konhar and Mech (1988) reported highest fruit retention in cashew with Nutron 500 ppm, followed by Etherl 50 ppm and Planofix 45 ppm. Similarly, Kumar *et al* (1994) found

Ethrel®50 ppm, NAA 25 ppm and 2, 4-D 4 ppm to be most effective in improving sex ratio and yield. The present investigation was under-taken to assess efficacy of Ethrel® in flowering behavior and yield enhancement in cashew.

An experiment was conducted on seven year old cashew trees of Vengurle-7 (V-7) hybrid grown on lateritic soils during the fruiting season of 2008-09 at Regional Fruit Research Station, Vengurle, Dist. Sindhudurg, Maharashtra. The experiment was designed in Randomized Block Design, with five treatments and four replications. The climate of the region is warm and humid, with an annual rainfall of 2916 mm and temperature range of 17.4^o C to 32.9^o C. The research center is situated at an elevation of 9 m above mean sea level.

Three sprays of each treatment were given as follows: i) before the vegetative flush, ii) after the vegetative flush and iii) during fruit-set. Recommended package of practices was followed uniformly, including plant protection. Observations were recorded number of laterals before and after spray, number of flowering panicles per m², flowering duration, number of staminate and perfect flowers, fruit-set per m², number of nuts per panicle, nut weight and nut yield. Number of staminate and perfect flowers was recorded every day till completion of flowering. Sex ratio was calculated using the formula developed by Abdul Halim Hassan *et al* (1988) for calculating sex ratio in oil palm, i.e.,

$$\text{Sex Ratio} = \frac{\text{Number of perfect flowers}}{\text{Total number of flowers}}$$

Results were statistically analyzed following the procedure given by Panse and Sukhatme (1985).

Various biometric observations were recorded at specific stages and are presented in Tables 1 and 2.

Effect of Ethrel® spray on growth and flowering

It is evident from data presented in Table 1 that the mean number of laterals m⁻² was significantly higher in the control (T₁), water spray (T₂) and Ethrel®400 ppm (T₅) than Ethrel®100 or 200 ppm (T₃ and T₄, respectively). However, after the sprays, water spray (T₂) was significantly superior to the other treatments with respect to number of laterals, followed by control (T₁) and Ethrel®400 ppm (T₅) which were at par with each other and significantly superior over Ethrel®100 ppm (T₃) and Ethrel® 200 ppm (T₄). Further, regarding growth and flowering behavior in cashew, it was observed that water spray (T₂) resulted in better vegetative growth of trees, which is clear from higher percent increase in the laterals after spray, and was followed by Ethrel® 100 ppm. However, the concentrations of Ethrel®, viz., 200 and 400 ppm (T₄ and T₅) resulted in negligible increase in the laterals after spray, i.e., 20.5 and 26.5, respectively and percent increase in laterals in these two treatments was 1.0 and 1.1%, respectively over the control (3.7%). In respect

of flowering behaviour, Ethrel® treatments of 100, 200 and 400 ppm (T₃, T₄ & T₅) showed a positive impact and produced significantly higher number of flowering panicles, i.e., 12, 10 and 11 m⁻², than in control (T₁) or water spray (T₂), i.e., 7.3 m⁻².

Effect of Ethrel® spray on sex-expression and yield

The total number of staminate flowers was significantly higher (629.0) under water spray (T₂) than in rest of the treatments (Table 2). This was followed by control (T₁) which was also significantly superior to Ethrel® treatments. Among Ethrel® treatments, Ethrel® 200 ppm (T₄) and 400 ppm (T₅) were at par and were also significantly superior to Ethrel® 100 ppm (T₃). Results of the present study clearly indicated that the number of staminate flowers was directly related to the number of laterals per m². Higher number of laterals under water sprays and control resulted in higher number of staminate flowers. Ethrel® 100 ppm (T₃) produced an average of 52.8 and 400 ppm (T₅) 48.8 total number of perfect flowers, which was at par but significantly superior to the remaining treatments. Higher number of perfect flowers under Ethrel® 100 ppm (T₃) and 400 ppm (T₅) can be attributed to the role of Ethrel® in increasing the number of perfect flowers. Percent increase in perfect flowers over control was highest under 100 ppm Ethrel® (T₃), followed by Ethrel® 400 ppm (T₅). This is in agreement with previous investigations in cashew by

Table 1. Effect of Ethrel® spray on growth and flowering in cashew

Sl. No.	Treatment	Mean number of laterals before spray/m ²	Mean number of laterals after spray/m ²	% increase in number of laterals after spray	Mean number of flowering panicles /m ²	Mean of flowering duration(Days)
1.	T ₁ Control (No spray)	27.0	28.0	3.7	7.3	102.5
2.	T ₂ Water spray	26.0	32.0	23.1	7.3	101.3
3.	T ₃ Ethrel 100 ppm	18.3	19.3	5.5	12.0	101.0
4.	T ₄ Ethrel 200 ppm	20.3	20.5	1.0	10.0	104.0
5.	T ₅ Ethrel 400 ppm	26.2	26.5	1.1	11.0	102.5
	SEm±	0.8	0.6		0.8	1.9
	CD (P=0.05)	2.5	1.9		2.4	NS

NS = Non-significant

Table 2. Effect of Ethrel® spray on sex expression and yield in cashew

Sl. No.	Treatment	Total no. of staminate flowers	Total no. of perfect flowers	% increase in perfect flowers over control	Sex ratio	Total no. of flowers	% flowers staminate	% perfect flowers	Mean fruit set /m ²	Mean no. of per nuts	Mean yield (kg/ tree) panicle	Mean nut weight (g)
1.	T ₁ Control(No spray)	515.3	19.0	--	0.04	534.3	96.4	3.6	17.3	1.6	0.88	8.2
2.	T ₂ Water spray	629.0	12.8	-33.0	0.02	641.8	98.3	2.0	23.8	1.6	0.93	8.3
3.	T ₃ Ethrel 100 ppm	240.0	52.8	178	0.19	292.8	82.0	18.0	28.8	2.9	1.51	8.5
4.	T ₄ Ethrel 200 ppm	347.3	20.0	5.3	0.05	367.3	94.6	5.4	18.0	2.0	0.95	7.0
5.	T ₅ Ethrel 400 ppm	371.0	48.8	157	0.12	419.8	88.4	11.6	18.0	2.4	0.88	8.2
	SEm±	34.2	8.2			38.9	1.5	1.4	1.4	0.2	0.06	0.4
	CD (P=0.05)	105.4	25.2			120.2	4.7	4.2	4.3	0.7	0.19	NS

NS = Non-significant

Mariappan *et al* (1995) and Gajbhiye *et al* (2007). Further, under water spray, there was a decline in number of perfect flowers compared to control. Therefore, sex ratio was also higher under Ethrel® 100 ppm (T₃), followed by Ethrel® 400 ppm (T₅). This is in agreement with previous findings of Mariappan *et al* (1995) in cashew. Dorajeerao *et al* (2001) reported that clones having broader sex-ratio were high yielders. Ethrel® 200 ppm (T₄) recorded less number of perfect flowers (20.0) and higher percentage of staminate flowers (94.6%), resulting in lower sex ratio. In the present investigation Ethrel® at 100 ppm might have exert its effect on sex expression by manipulating endogenous auxin corresponding the reduction in staminate flowers as reported by Mariappan *et al* (1995).

In the case of total number of flowers, water spray (T₂) was at par with control and was significantly superior over Ethrel® treatments. Among Ethrel® treatments, Ethrel® 400 ppm (T₅) was at par with Ethrel® 200 ppm (T₄) and significantly superior to Ethrel® 100 ppm (T₃). This was mainly due to higher number of staminate flowers under water spray and control. Further, it was observed that the percentage of staminate and perfect flowers was negatively correlated and, therefore, higher percentage of perfect flowers (18%) was observed with Ethrel® 100 ppm (T₃). Similarly, in the case of mean fruit set per m², it was significantly higher (28.8) under Ethrel® 100 ppm (T₃) than in the remaining treatments. This can be attributed to higher number of perfect flowers and higher percentage of perfect flowers under Ethrel® 100 ppm (T₃). The present findings are in conformity with results of Mariappan *et al* (1995) in cashew.

Finally, the mean yield per tree was also significantly higher under Ethrel® 100 ppm (T₃) than in the remaining treatments. This can be attributed to the availability of significantly higher sinks under Ethrel® 100 ppm (T₃) in respect of perfect flowers, fruit set m⁻² and number of nuts per panicle. Gajbhiye *et al* (2007) and Mohan and Rao (1995) also reported highest nut yield with Ethrel® spray. However, the mean nut weight was not significantly influenced by spray treatments.

ACKNOWLEDGEMENT

The authors are grateful to Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli, for providing funds and facilities to carry out this work.

REFERENCES

- Abdul Halim Hassan, Mohamad Ali Sekak and Mohd Hanif Harun. 1988. Plant growth regulators in Oil Palm, In: *Proceedings of the International Congress of Plant Physiology*, New Delhi, February 15-20, 1988, I:451-458
- Bhat, M.G., Yadukumar, N. and Nayak, G.M. 2007. Cashew Research Achievements, Technologies Developed and Research and Development Strategies. National Seminar on Research, Development and Marketing of Cashew. In: Souvenir and Extended summaries, ICAR Research Complex for Goa, 20-21st November, 2007 pp.3-15
- Dorajeerao, A.V.D., Ravisankar, C. and Reddy, M .L. N. 2001. Influence of flowering phases on nut yield of different cashew clones. *J. Plantation Crops*, **28**: 55-60
- Gajbhiye, R.C., Jalgaonkar, V.N., Bendale, V.W. and Gawankar, M.S. 2007. Effect of Growth Regulator to Improve Fruit Set and Yield in Cashew. National seminar on Research, Development and Marketing of Cashew. In: Souvenir and Extended summaries, ICAR Research Complex for Goa, 20-21st November, 2007 pp. 136-137
- Konhar, T. and Arun Mech. 1988. Effect of growth regulators on flowering, fruit set and fruit retention in cashew. *Ind. Cashew J.*, **18**:17-19
- Kumar, D.P., Khan, M.M. and Melanta, K.R. 1994. Effect of growth regulators on sex expression, fruit-set, retention and yield of cashew. In: Proc. of the XI Symposium on Plantation Crops.
- Mariappan, S., Prabhakaran, J. and Sambandamoorthy, S. 1995. Effect of growth regulators on sex expression and fruit set in cashew (*Anacardium occidentale* L.). *The Cashew* **IX**: pp11-13
- Mohan, E. and Rao, M.M. 1995. Effect of growth regulators and pruning on the growth and yield of cashew. *Environment & Ecology*, **13**:675-679
- Panase, V.G. and Sukhatme, P.V. 1985 . Statistical methods for Agricultural Workers. 4th edition, ICAR, New Delhi.
- Pillai P.B. 2008. Excerpt of speech delivered during 53rd Annual General Meeting held on 30.09.2008. *The Cashew*, **XXII**: 11

(MS Received 5 October 2009, Revised 4 February 2010)