research article | International Journal of Plant Sciences, (July to December, 2009) Vol. 4 Issue 2 : 440-443

Interaction between GA_3 and CCC on growth, chlorophyll content, yield and oil content of seamum (*Sesamum indicum* L.)

K.C. SARMAH AND C.M. SARMA

Accepted : April, 2009

SUMMARY

A field experiment was conducted to study the relative efficacy of PGRs in rapeseed varitety M-27. Foliar applications of CCC and ethrel in varying concentrations was tried. CCC at its optimal concentration of 500 µg/ml exhibited better growth and increased the yield while ethrel at its optimal concentration of 100 µg/ml improved the yield. In the experiment CCC registered better growth performance than ethrel.

Key words : PGR (Plant growth regulator), CCC (2- Chloroethyl trimethyl ammonium chloride or Chlorocholine chloride), Ethrel (2- Chloroethyl phosphonic acid), Rapeseed plant variety M-27, Growth and yield.

The rapeseed variety M 27 is an important oil yielding plant. It is largely grown in Assam under normal agroclimatic condition. Though this variety is certified as one of the high yielding variety yet its cultivation has not been done to the extent of meeting the demand. Plants growth substances can modify plant growth and development raising the productivity level of crop on proper application. (Kene *et al.,* 1991). Therefore, the present study was undertaken to assess the uses of two growth regulators CCC and ethrel known as, growth retardants on the growth performance of rapeseeed. The plant growth retardant like CCC (2- Chloroethyl trimethyl ammonium chloride or Chlorocholine chloride) and ethrel (2- Chloroethyl phosphonic acid) have found wide application due to their dwarfing properties which help in imparting the lodging resistance(Pandya *et al.,* 1974) of the plants. Besides these effect CCC and ethrel modify the crop canopy and initiates luxurious vegetative growth that may be beneficial for flower initiation and fruiting points. Singh *et al.* (1993) revealed that application of CCC or ethrel on *Brassica napus* improved the translocation of photosynthates from source to sink and thereby produced good yield. Basing on this information the present study was designed to have better knowledge about the effect of CCC and ethrel on *Brassica campestris* cv - M 27 as the average yield has not touched the expected rate in Assam despite the variety M-27 is certified as one of good variety.

Correspondence to:
K.C. SARMAH, Department of Botany Mangaldai College, MANGALDAI, (ASSAM) INDIA
Authors' affiliations:
C.M. SARMA, Department of Botany, Gawhati University, GUWAHATI (ASSAM) INDIA

MATERIALS AND METHODS

Healthy seeds of the rapeseed variety M-27 were sown during the month of October (1998) in different plots (plot size 90 cm x 60 cm) in rows in random block design which was replicated three times. The pH of the land was about 6.0. The land selected for the experiment was ploughed and reploughed with subsequent ladderings till the desired fine tilth for the crop was obtained. Basal application of farmyard manure at recommended doses of 3 tonnes/ ha and recommended doses of urea, SSP (Superphosphate), MOP (Murate of Potash) in the proportion 13.0: 25.0: 6.0 kg/ha, respectively were applied in the field. To prevent the presence of soil insects BHC 10 per cent dust was applied along with the last ploughing in proper doses. Borax at the dose of 10 kg /ha was also applied along with the above fertilizer.

After 4.0 days of sowing, foliar spray was done with CCC at 50, 100, 250 and 500 µg/ml and ethrel at 10, 50, 100, and 500 µg/ml on the plants. Control samples were sprayed with sterile distilled water.

The seeds were planted in furrows. The row to row and plant to plant spacing were maintained at 3.0 cm and 15 cm, respectively. The net plot size was measured as 9.0 cm x 6.0 cm. In each plot of each replication 6 (six) plants were maintained of which 3 (three) plants were taken for observation.

The parameters studied for the experiments are

- Shoot length (cm)
- Number of leaves / plants
- Number of branches / plants
- Number of pods / plant
- Seed yield q / ha
- Oil content of seeds in percentage.

The mean growth of the plant and yield were worked

out from the data of three replications. To have greater reliance of the findings on growth, oil and yield the pooled data were analysed statistically.

Seed yield was calculated converting the plot area into hectare. The oil in percentage from the repeseeds of each treatment was determined by Cold extraction method (Kartha and Sethi, 1957).

RESULTS AND DISCUSSION

In the experiment CCC maintained its retarding activities reducing stem elongation. The data revealed that CCC retarded the stem elongation upto 500 μg/ml. CCC at its 50, 100, 250 and 500 μg/ml recorded stem length as 62.0, 60.4, 59.76 and 56.00 cm which was much lower compared to 67.3 cm at control. This corroborates the findings of Ketole and Salim (199.0) and Rajput *et al.* (1996) in mustard. Like CCC the ethrel also retarded the stem length. Of course the intensity of retardation by ethrel was less than that of CCC. Ethrel recorded stem length as 63.5, 63.1, 60.3 and 62.08 cm at its concentration of 10, 50, 100 and 500 μg/ml, respectively. The retardation in plant height caused by CCC and ethrel might be due to inhibition of cell division in subapical meristematic region leading to shortening of internode length (Zeevart 1966, Krishnamoorthy 1981)

The retardation on growth in length caused an increased number of branches and leaves. The number of branches and leaves increased gradually with the rise of concentrations of CCC within the range of 50 μg/ml to 500 μg/ml. Like CCC ethrel also modified the cell growth pattern, stimulating lateral expansion and cell wall thickness while it reduced cell elongation (Jose *et al.*, 1992) and ultimately it produced more number of lateral shoots and increased leaf numbers. Manna and Mukherjee (1983) in chrysanthenum and Gupta *et al.* (1996) in *Ocimum carnosum* found similar results on application of ethrel.

The number of branches as well as number of leaves gradually increased with the rise of concentrations of CCC from 50 μg/ml to 500 μg/ml and at ethrel treatment from 10 to 100 μg/ml, while a higher concentration of ethrel 500 μg/ml showed a declining trend. This present findings on leaves and branches substantiate the earlier observations on ethrel made by Bhattacharjee (1989) in Jasminum and on CCC by Cheema *et al.* (1987) and Saini *et al.* (1987). A comparative study on the development of laterals between the two growth regulating chemicals CCC and ethrel made it clear that CCC at its optimal concentration 500 μg/ml recorded 38.66 number of leaves and l2.3 number branches while ethrel at its optimal concentration of 100 μg/ml produced 33.3 number of leaves and 10.76 number of branches. This shows that effectiveness of CCC was higher than ethrel and this finding was also in conformity with the findings of Sarma (2001) in *Coieus parviflorus*

In response to CCC and ethrel treatment the number of pods per plant was also higher than that of control. This increased in number of pods may be attributed to

Table 1: Effect CCC and ethrel on *Brassica campestris* L (cv-M 27)

Chemicals (μg/ml)	Height (cm) 80 days	Leaves (in Number)	Branches (in Number)	Pods (in Number)	Seed yield q/ha	Oil (%)
Control	67.3 ±0.66	28.3±0.57	7.7 ± 0.33	149.1±2.55	10.9±0.33	43.0±0.0
CCC 50	62.0±0.57	35.3±0.33	10.3±0.33	221.0±3.05	12.3±0.33	42.8±0.16
	(+7.87)	(+24.7)	(+33.76)	(+18.22)	(+12.8)	(+0.46)
CCC 100	60.4±1.1	35.3± 0.57	11.3±0.33	249.3±8.25	13.0±0.0	43.5±0.35
	(+ 10.25)	(+24.7)	(+46.75)	(+07.2)	(+ 19.26)	(+1.16)
CCC 250	59.76±0.83	37.3±0.0	11.8±0.18	250±5.58	13.2±0.09	42.66±0.16
	(+11.2)	(+31.8)	(+53.2)	(+67.67)	(+21.1)	(-0.79)
CCC 500	56.0±0.0	38.66±0.33	12.3±0.57	254±2.08	13.4±0.09	43.3±0.33
	(+ 16.79)	(+36.6)	(+59.74)	(+7.35)	(+22.9)	(+0.69)
Ethrel 10	63.5±0.23	31.1±1.1	9.1±0.l	181.0±3.05	11.4±0.31	42.66±0.16
	(+5.6)	(+9.89)	(+18.18)	(+21.39)	(+4.58)	(-0.79)
Ethrel 50	63.1±0.49	32.0±1.0	10.0±0.57	192.0±2.64	12.1 ±0.2	43.0±0.0
	(+6.2)	(+13.07)	(+29.87)	(+28.77)	(+ 11.0)	(+0.0)
Ethrel 100	60.3±0.33	33.3±0.4	10.76±0.23	241.3±4.48	13.3±0.03	43.16±0.16
	(+10.2)	(+17.66)	(+39.7)	(+61.8)	(+22.0)	(+0.37)
Ethrel 500	62.08±0.91	29.1±1.15	10.1±0.58	217.0±4.72	12.3±0.36	41.66±0.16
	(+7.75)	(+2.8)	(+31.16)	(+45.5)	(+ 12.8)	(-3.1)

Figures in parenthesis show % increase (+) Decrease (-) over control.

the increased number of branches and leaves along with the production of more flowers. The production of flowers is related to the number of branches and other growth parameters. In the present finding CCC treated plants at its concentration 50, 100, 250 and 500 µg/ml exhibited number of pods as 221.0, 249.3, 250.0 and 254.0 while ethrel at its concentrations 10, 50, 100 and 500 µg/ml exhibited number of pods as 181.0, 192.0, 241.3 and 217.0 as against 149.1 at control. Hati Barna *et al.* (1997) observed that production of flower tended to decrease with the rise in concentration of ethrel in tube-rose. Similar observation was also made by Sebastian *et al.* (1995) on Cinnamon who reported that higher concentration of ethrel did not influence seed germination or subsequent seedling growth CCC produced highest number of pods 0/ plant at 500 mg/ml. Similar result on CCC was also reported by Nawalagatti *et al.* (1991) in ground nut, Shadeque and Pandit (1982) in potato.

The seed yield due to application of CCC and ethrel was also increased. The higher quantity of seed yield was found as 13.4 q/ha at 500 µg/ml CCC (optimal) as against 10.9 q / ha at control. Singh *et. al.* (1988) reported that due to the application of CCC on Indian mustard the seed index, harvest index, oil content and seed yield increased by 6, 20, 9 and 20 per cent, respectively over control. An idential finding was also reported by Rajput *et al.* (1996) on Indian mustard by the application of CCC. Almost similar effect of ethrel like CCC was also reported by number of workers such as Cheema *et al.* (1987) and Saini *et al.* (1987) in mustard. Working on *Curcurbita moschata* Verma *et al.* (1987) reported that ethrel at 100 ppm proved to be the best in incerasing the number of fruits. This result substantiates the present findings.

In case of oil content minimum differences were noted in between treated and untreated plants. But an enhanced production of pods/plants and higher seed yield in treated plants acted as a major factor in increasing overall oil yield.

REFERENCES

Bhattacharjee, S.K. (1989). Growth and flowering of *Jasminum sambac* Ait as influenced by ethrel spray. *And. agric.*, **33** (1) : 17- 21

Cheema, S.S., Singh, H. and Sahota, T.S. (1987). Growth regulators for improving crop productivity. In : Srivastava, H.C., Bhaskaran, S. and Menon, K.K.G. (eds) *Crop productivity,* Oxford and IBH Publishing Co-Pvt. Ltd. New Delhi, P. 91-115

Gupta, S., Kumar, A. and Kaul, B.L. (1996). Suppression of flowering with bioregulators : An approach towards yield improvement in *Ocimum carnosum* LK Otto. *Ind. Perfumer,* 40 (4) : 121-4

Hati Barua, P., Gogoi, S. and Mazumdar, A. (1997). Effect of pre-plant chemical treatment of bulbs on growth and flowering of tuberose (*Polianthes tuberosa* L.) cv. SINGLE. *Annl. Biol. Ludhiana*, **13** (1) : 145- 9

Jose, S.B., Ana, M.O., Manuel, P.G., Manuel, A. and Francisco, S. (1992). Modification by ethylene of the cell growth pattern in different tissues of etiolated lupine hypocotyls. *Plant Physiol.*, **98**: 1121-1127.

Kartha, A.R.S. and Sethi, A.S. (1957). A cold percolation method for rapid gravimetric estimation of oil quantities of oil seed. *Indian J. agric. Sci.*, **27**: 211

Kene, H.K., Sontakey, P.Y., Kale, M.R. and Takzure, S.C. (1991). Effect of piano fix and cycocel on growth and yield of sunflower *(Helianthus annuus* L.). *New Agriculturist,* **2** (1) : 39- 42.

Ketole, N.S. and Salim, M. (1990). Response of mustard (*Brassicajuncea* L. Zern and Coss) to growth regulators and their times of application. *Rajasthan agric Univ. Res. J.*, **4** (1-2) : 68-70

Krishnamoorthy, H.N. (1981). *Plant growth substances, including application in agriculture.* Tata Mcgraw Hill Publishing company Ltd. New Delhi

Manna, D.C. and Mukherjee (1983). Effects of ethrel on growth and flowering of chrysanthemum *(Chrysanthemum morifolium* RAM). *Indian agric.*, **27** (3) : 241-245.

Nawalagatti, C.M., Panchal, Y.C., Manjunath, S. and Channappagoudar, B.B. (1991). Effect of different level of plant growth regulators on growth and yield of groundnut. *J. Maharastra agric. Univ.*, **16** (1) : 122 -123

Pandya, R.B., Khan, M.L., Gupta, S.K. and Arora, S.K. (1974). Effect of cycocel on growth, yield and chemical composition of Raya (*Brassicajuncea coss*). *Biochem Physiol Pilanzen* (BPP) Bd. (165.8) : 283-289

Rajput, R.L., Shrivastava, U.K. and Verma, O.P. (1996). Effect of growth regulators on growth and yield of Indian mustard. *(Brassica juncea L.). Agric Sci. Digest.*, **16** (2): 111-114.

Saini, J.S., Jolly, R.S. and Singh, O.S. (1987). Int1uence of chloromequat on the growth and yield of irrigated and rainfed Indian mustard. (*Brassica juncea*) in the field. *Expl. agric.*, **23**: 319-324.

Sarma, P. (2001). Interactions of plant growth regulators on dormancy, growth and yield of *Coleus farviflorus.* Ph. D. Thesis. Gauhati University, Assam.

Sebastian, S., Farooqi, A.A., Subbaiah, T. (1995). Effect of growth regulators on germination and seedling growth of cinnamon (*Cinnamomum zelyanicum* Breyn.) *Indian Perfumer,* **39** (3) : 127-30

Shadeque, A. and Pandit, M.L. (1982). Effect of cycocel (CCC) as foliar spray on growth, yield and quality of potato *(Solauum tuberosum* L.) *J. Res. Assam agric. Univ.,* **3** (1) : 34 - 39

Singh, G.R., Kolar, J.S., Cheema, S.S. and Singh, G. (1993). Studies on the use of growth regulators in relation to nitrogen for the enhancing sink capacity and yield of gobhisarson (*Brassica napus*). *Indian J. Plant Physiol.,* **36** : 1-4

Singh, K., Afria, B.S. and Kakralya, B.L. (1988). Relative efficacy of plant growth regulators in Indian mustard. *Indian J. Agron.,* **33** (4) : 432-435.

Verma, V.K., Singh, N. and Chowdhury, B. (1987). Effect of some growth retardants and ethrel on fruit set and yield in pumpkin *Cucurbita moschata*. Duch. Ex. POIR. *Madras agric. J.,* **74** (6-7) 296-301

Zeevaart, J.A.D. (1966). Reduction in the gibberellin content of *Pharibitis* seeds by CCC and after effects in progeny. *Pl. Physiol.,* **41** : 856-862

****
*****