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Response of *Ricinus communis* to chelated Iron & Zinc

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Abstract
Ricinus communis belong to Euphorbiaceae family commonly called Castor oil plant. Castor oil plant is cultivated for the seeds which yield fast drying non yellowing oil used mainly in industry and medicines. Castor seeds are large and slow to germinate. Emergence of seedlings may take 7 to 14 days. Nutrient deficiencies in plants have been corrected by using metal chelators. They are more effective than normal salt of these nutrients. In the present study the various doses 20, 50 and 100 ppm of Fe- EDTA and Zn- EDTA shows the germination percentage increase over control and induced growth of shoot and number of lateral roots, but length of root was decreased. 50 ppm of Fe- EDTA and Zn- EDTA gives best effect on seed germination% increase over control i.e (46.67) and (33.33%) over control repectively.
The length of Shoot and no. of lateral root increase to a maximum with 50 ppm of Fe- EDTA (4.8 cm and 29.6 cm respectively) and with 50 ppm of Zn- EDTA (4.2 cm and 25.8 respectively).

Keywords: Ricinus communis, metal chelators, Fe- EDTA, Zn- EDTA

Introduction
Castor oil plant is grown as an annual plant and its dwarf variety reaches a height of 4-5 meter. Plant have tap root system prominently branched lateral roots. Castro seeds are large and slow to germinate. Emergence of seedling may take 7 to 14 days. *Ricinnus communis* is generally grown as a weed in poor soil, having relatively low fertility level. Therefore it would require a sustained supply of soil nutrient to ensure maximum seed yield partly due to restricted retranslocation of most nutrients from capsule during maturation. Plant nutrition using balanced fertilization program with both macro and micronutrient has become very important in the production of high yield with quality products. Among the many macro and micronutrients essential for plant growth, iron and zinc are the essential metal for cell metabolism. Nutrient elements like iron, zinc are absorbed in the form of ions or chelates from the soil solution. “Chelator is a compound with a metal atom joined to two or more electron donar of single organic molecule. This gives a ring configuration in which the metal is firmly held and the complex has charge and solubility properties alien to the metal itself”. Metal Chelator are soluble in water and dissociate slightly. It is because of this fact; they are ideally suited for application to the crops deficient in particular micronutrients. They are more effective than the normal salt of these nutrients. The absorption of Fe and Zn salt were greater with Fe- EDTA and Zn- EDTA than Fe and Zn were given alone.
The metal ions bound to chelating agent are absorbed by the plant without interference of other minerals which would hinder its transport.

Methodology
The seeds of *Ricinus communis* Linn. (Variety – Chandraprabha) were obtained from Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The seeds were sown in the first week of September and the observations were completed by the end of March. Metal Chealtors i.e. ethylene diamine tetraacetic acid in combination with mineral iron and zinc were obtained from the market.

Preparation of Solution
For the preparation of solution of metal chelators one gram of each chelators were taken in an individual neat and clean beaker. These chemicals were dissolved in 500ml distilled water with constant stirring. The volume of solution was finally constituted to one liter. This were the 1000 ppm stock solution of each chemical, flask containing chemicals were covered with muslin cloth to avoid any contamination for preparation of 10, 20, 50, 100 and 200 ppm solution of each metal chelator 10, 20, 50, 100 and 200 ml of liquid from the stock solution were taken in a well cleaned measuring flask snd constituted to 1000 ml.

Placing the Seeds for germination
Preliminary experiments on seed germination and seedling growth were conducted by Garrad’s technique in test tube. For Garrad’s technique seeds were placed in test tubes between blotting paper and walls of the tubes. The level of water and experimental solution of metal chelators were made upto the marked level every alternate day. After proper making, the seed samples were placed foe germination were recorded on the tenth day. The number of germinated seeds, normal seedlings, abnormal seedlings, dead seedlings, root length, number of lateral roots, shoot length were measured in cm. and averaged.

Observation

Table 1: Influence of metal chelators on seed germination of *Ricinus communis*

Metal Chelators	Dose	% of germination
Fe-EDTA	10	61
	20	76
	50	88
	100	80
	200	32
Zn-EDTA	10	60
	20	68
	50	80
	100	72
	200	44
	Control	60

Table 'A' reveals increased germination percentage of seed with 50 ppm Fe-EDTA were maximum (88%) followed by 50 ppm Zn- EDTA (80%) as compare to control (60%).

Table 2: Influence of metal chelators on seedling growth of *Ricinus communis*

Metal Chelators	Dose	Length of root (Cm)	Length of shoot (Cm)	% of germination
Fe-EDTA	10	10.1	2.5	18.3
	20	9.6	3.6	26.3
	50	8.2	4.8	29.6
	100	7.2	4.2	19.5
	200	4.3	1.2	8.4
Zn-EDTA	10	10.2	2.1	14.8
	20	9.8	3.2	22.5
	50	8.7	4.2	25.8
	100	7.8	3.5	18.3
	200	6.5	1.6	12.5
	Control	10.3	2.3	14.2

Table B reveals induced growth of shoot and no. of lateral root and it was maximum with 50 ppm of Fe-EDTA (4.8 cm and 29.6 cm respectively) as compare to control (2.3 cm and 14.2 cm respectively). The length of primary root decreased with increase in concentration as compare to control and was maximum with 200 ppm of Fe-EDTA (4.3 cm). Figure A shows the percentage increase or decrease as compared to control.

Treatment of 50 ppm of Fe-EDTA promoted the maximum length of shoot and no. of lateral roots (108.7% and 108.45% respectively) followed by 50ppm of Zn- EDTA (82.61% and 81.69% repectively). Primary root length decreased with increase in concentration and was minimum with 200 ppm of Fe-EDTA (decreased by 58.25 respectively).

Discussion and Result

In the present investigation the effect of metal chelators on *Ricinus communis* showed interesting result during the present study. The promontory effect has revealed interesting facts which is of applied significance.

In the present investigation soaking seeds of *Ricinus communis* for 48 hours in 20, 50 and 100 ppm of metal chelators i.e Fe-EDTA and Zn- EDTA resulted in enhanced germination of seed, growth of shoot and no of lateral roots. Peuke *et. al*. (2002) found that root shoot ratio increased in *Ricinus communis* seedling under potassium limitation. A number of chemicals have been known to influence seed germination by promoting faster germination inducing greater seedling-vigour (Sankhla and Sankhla 1968; Mayer and Shain 1974). Veer (1983) observed the effect of metal on germination and seedling growth of Pisum sativum seed imbibed in higher concentration of nickel sulphate were inhibitory while lower concentration were promontory to seedling growth enhancement of seedling growth of Wheat, Oat, Soybean with low concentration of chelating agent was observed by Coil 1952, Heath and Clark 1956 a:b 1960 and Brown *et al*. 1960.

It therefore become interesting to understand the effect of metal chelator on seedling growth of *Ricinus communis* before studying their effect on flowering and yield. Fertilizers which are used to increase the growth of the crop also increase eutrophication due to increased amount of phosphorous and nitrate. The accumulation of excess salt through the application of chemical fertilizers threatens production of crops. Application of chelators with the essential nutrient elements could be more effective and beneficial. The metal chelators can help to promote the much required productivity of castor oil with improved quality of the produce. The right treatment may especially help to correct the mineral deficiencies when the crop is grown on less fertile soil.

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