ORIGINAL RESEARCH PAPER

Agricultural Science

IN VITRO EFFECT OF CROPSIL ON SEED GERMINATION AND SEEDLING GROWTH OF MAIZE-PART ONE

KEY WORDS:

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ABSTRACT

Silicon is the second most abundant element in the earth crust after oxygen i.e. 28.8%. However, Silicon present in soil is in an inert or polymeric form, which is unavailable form of Silicon for plant uptake. Generally, plants uptake monomeric form of Silicon in soil i.e. plant available silica. Monosilisic acid (H4SiO4) or Orthosilisic acid is the form of Silicon which is completely bio-available to the plants. NiChem Solutions, Thane have developed a new product – CROPSIL based on monomeric silica to fulfil the requirement of Silicon as a beneficiary nutrient in plants.

CropSil is a unique formulation of highly stabilized Orthosilisic acid (Monosilisic acid form). CropSil contain 3% Orthosilisic acid which is 99.9% available form of Silicon. It has an alkaline pH. CropSil acts as a plant stress manager, immunity booster, yield improver & a bio stimulant. It is a residue free, non-toxic and eco-friendly product. It has a good stability & does not gel on shelf when stored in air-tight conditions away from direct sunlight. (It has Patent pending in India & US. The International Publication number of CropSil is WO2016/135752 A2).

Seed germination and early seedling growth are critical stages for plant's establishment and production. Priming or seed imbibition application of Silicon (Si) can enhance germination as well as seedling growth. In this experiment, the effect of seed imbibition with CropSil (1%, 2%, 3% solution) on seed germination and seedling growth under normal conditions was studied in Maize. The experiment was designed at Nichem Solutions in invitro conditions.

Results showed that seed Imbibition by different concentration of CropSil i.e. (1%, 2% and 3%) improved shoot length (1.3%, 10% and 10.9%), root length (0.0%, 13.6%, 24.2%) and biomass (12.41%, 33.33%, 39.40%) with increasing concentrations as compared to Control.

INTRODUCTION

Maize (*Zea mays* L.) is an important crop in the world. It is widely used for feed and industrial raw material. Maize ranks third in world production followed by wheat and rice for the area and production. It is also the main crop of northern China, where the climate is a combination of temperate and semi-arid monsoon. Rapid and uniform field emergence is an important factor to achieve higher yield to meet the growing demand for food & energy.

Various priming treatments have been developed to increase the speed and synchrony of seed germination, common priming techniques include hydro priming (soaking seed in water), osmopriming (soaking seed in osmotic solutions such as PEG), halo priming (soaking seed in salt solutions), and priming with plant growth hormones. However, different priming effects were reported with different priming reagents and species. For instance, when *Lolium perenne* seeds were primed with PEG solution, the germination was significantly improved, but no obvious effects were observed with *Festuca rubra*, *Festuca ovina*, and *Poa trivialis.* Seed priming with optimal concentrations of plant growth hormones, such as auxin (IAA), gibberellins (GA), abscisic acid, and ethylene has proven that germination performance as well as growth and yield of many crop species under both normal and stress conditions could be improved effectively (Ahmad, 2007).

In recent years, numerous studies were devoted to the physiological responses of seed germination and seedlings stages to chilling or osmotic stress (Prisco, 1997). To elucidate the ecological responses of different pre-treatments to Maize species, it may be useful to investigate the changes in not only germination stage, but also seedling growth and yield response.

In this study, we used CropSil, which is unique formulation of highly stabilized, Orthosilisic acid (OSA) to investigate the germination and seedling growth after seed treated with CropSil (1%, 2% and 3%) and Control.

MATERIALS AND METHODS

Germination & seedling growth response of Maize (*Zea mays)* to CropSil supplementation was evaluated in an experimental design at laboratory in November, 2018. Seeds of Maize were collected from a local seed shop. About 40-50 seeds were surface sterilized in 5% solution of Sodium hypochlorite. Then, they were put between two layers of germination papers (Roll towel paper method). Papers were wet with respective treatment solutions before putting the seeds for germination. Papers were kept at room temperature and solution of each treatment was added at regular intervals on paper up to 7 days.

After 7 days of germination, Papers were opened and the normal seedlings were counted. The cotyledons, shoot & root length were measured immediately. Fresh weights of root and shoot were measured. The root and shoot of each treatment were kept in paper bags, oven-dried at 72°C for 24 hrs and weighed to obtain dry weight (Biomass).

RESULTS AND DISCUSSION

The study revealed that seed imbibition or seed treatment techniques using different concentrations of CropSil improved Maize plant's performance by increasing seed germination rate, root and shoot length followed by seedling biomass.

Germination and seedling establishment are critical stages of Maize which affect both quality and quantity of crop yield. Soil water content is the key factor affecting seed germination and

plant establishment in the semi-arid area. The present study showed that, the rate of hydration increased dramatically after seed treatment with CropSil as compared to control. This implies that seed treatment with CropSil improves seed germination of Maize seeds by speeding up imbibition. This could contribute to facilitate emergence phase of Maize.

The results of our germination tests indicated that seeds treated with various CropSil concentration increased the growth and germination rate of Maize. Growth in seeds treated with 3% CropSil solution showed maximum root length (**24.2 cm**), shoot length (**10.9cm**) and Biomass (**39.40 gm**) as compared with control.

The results of CropSil on Maize seed germination & growth are presented in Table 01.

Table 01: Effect of CropSil on Maize seed germination and growth.

Treatments	Root length & % increase over Control (cm)	Shoot Length & % increase over Control (cm)	Biomass (gm) & % increase over Control
Water	9.188	3.456	0.232
CropSil @1%	9.189 (0.0%)	3.5 (1.3%)	0.2608 12.41%)
CropSil @2%	10.433(13.6%)	3.8 (10.0%)	0.3098(33.53%)
CropSil @3%	11.41 (24.2%)	3.833 (10.9%)	0.3234(39.41%)

The photographic representations are as seen in Fig 01, 02 & 03 respectively.

Fig 01- Seed putting method

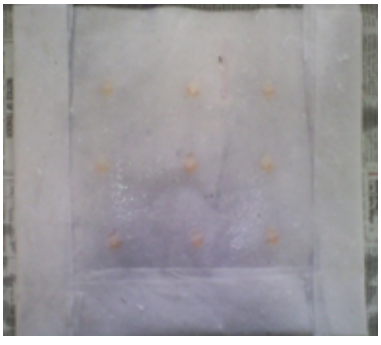

Fig 02- Roll towel paper germination method

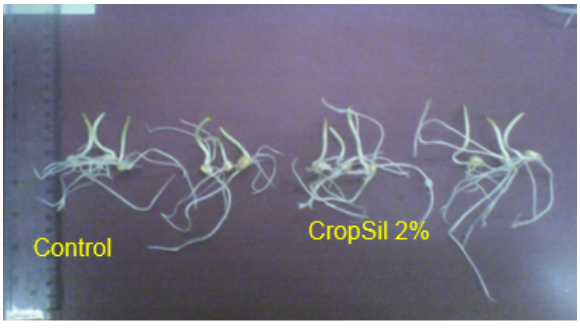

Fig 03 – Comparative germination growth of CropSil with Control.

SUMMARY AND CONCLUSION:

This finding indicated that the Maize seed treated with CropSil 3% concentration showed enhanced germination, increased root length, shoot length and biomass. Application of CropSil treatment to any other seed can be expected to be beneficial since the mechanism of action of CropSil will be universal.

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