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Research Paper

# SPERMOSPHERE MICRO ORGANISMS OF *CELOSIA ARGENTEA* L. AND IT'S RELATIONSHIP WITH GERMINATION STUDIES

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*Celosia argentea* L. is an herbaceous annual weed found in all semi arid crop plant fields of Andhra Pradesh. To establish seed germination strategies, spermosphere studies on this weed plant have been carried out. When these seeds were subjected for germination in laboratory conditions, the seeds germinated at pH 0.35 acidic pH of the medium. This observation led to the spermosphere microbial population estimation by standard methods. The microbes observed were *Aspergillus niger*, *Penicillium notatum*, *Fusarium solani*, *Bacillus subtilis*. When these microbes were grown individually in liquid media, the pH of the culture media was in the range of 5.0 – 6.9 (acidic pH). This showed that in natural conditions was these microbes will help by lowering the soil solution pH and the weed seed germination possible effectively.

**Keywords:** *Celosia argentea* L., Dormancy, Seed germination, Spermosphere

## INTRODUCTION

The seeds of *Celosia argentea* L. usually fail to germinate under the slightest droughty conditions (Fawusi, 1980). Successful cultivation of the flower depends on quality of seeds such as viability, vigor and storage potential, etc. (Mumtaz Khan, 2003). Soil moisture requirements for germination of sorghum, millet, tomato and *Celosia* were studied by Fawusi and Agboola (1980). Chauhan and Johnson (2007) was studied the Effect of Light, burial depth and osmotic potential on germination and emergence of *C. argentea* L. and effect of seed humidification on germinability, vigor and leakage in cockscomb

(*Celosia argentea* var. *crinata* L.) was studied by Mumtaz Khan *et al.* (2003). Effect of phytohormones on seed germination of *Celosia argentea* L. was carried out by Saritha (2010). Furthermore to these, the present investigation was undertaken.

## MATERIALS AND METHODS

**Studies on Seed Germination of *Celosia argentea* L:** *Celosia argentea* seeds were collected from the cultivated fields of Rompicherla area of Chittoor district on December 11, 2006 and tested with tap water, hot water, HCl and H<sub>2</sub>SO<sub>4</sub> for germination.

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### Studies on Spermosphere of *Celosia argentea*

**L. seeds:** *Celosia argentea* seeds were collected and they were surface sterilized with 0.1% HgCl<sub>2</sub> for 2-3 min. Again the seeds were transferred to sterile water containing petri plates. Then the sterilized seeds were transferred to cool potato dextrose agar media plates.

The unsterilized seeds were placed on PDA Petri plates. Then the petri plates were incubated in culture room at 28-30°C for 2-7 days. Observations were made from the next day for microbes around seeds on petri plates. Individual colonies from media plates to PDA slants. Czepak-dox liquid media were prepared for liquid cultures (Aneja, 2003). The medium contained NaNO<sub>3</sub> 3 g, K<sub>2</sub>HPO<sub>4</sub> 1 g, KCl, 0.5 g, MgSO<sub>4</sub> 7 H<sub>2</sub>O, 0.5 g, FeSO<sub>4</sub>7H<sub>2</sub>O, 0.01 g and Sucrose 30 g. This medium was making up to 1,000 mL. Finally the pH was adjusted to 7.0.

Five conical flasks were taken. Each conical flask contains 200 mL of liquid medium. The conical flasks were sterilized in autoclave. Already grown microorganisms which were present in the petri plates, were transferred to conical flasks. Each conical flask contained one type of microorganism. These conical flasks were

incubated in stable culture room at 28-30 °C for 15 days. After 15 days of incubation period, all the cultures were filtered through filter paper. The pH value of each culture was determined using digital pH meter.

## RESULTS

The unsterilized seeds contained *Penicillium notatum*, *Aspergillus niger*, *Fusarium solani* (Plate No. 2) and gram positive bacteria, i.e., *Bacillus subtilis* (Plate No. 1). When these microbes were grown individually in liquid media, the pH of the culture media was in the range of 5.0-6.9.

It is assumed that the seeds in the fields might be immersed in acidic soil that is promoted by the soil fungi and spermosphere fungi.

**Plate No 1: Spermosphere Bacteria of *Celosia argentea* L.**



**Plate No. 2: Spermosphere Fungi of *Celosia argentea* L.**



**Table 1: Percent Germination of *Celosia argentea* Seeds After 24 h Incubation**

S. No.	Treatment	% of Seeds Germination
1.	Ta water	0
2.	Hot water (60°C)	16%
3.	0.1N Hcl	0
4.	0.1N H <sub>2</sub> SO <sub>4</sub>	0
5.	0.35N Hcl	97%

Note: \*Average of 100 seeds of three replicates.

## DISCUSSION

The Spermosphere is the micro habitat formed around the germinating seed (Verona, 1963). The Spermosphere represents a short-lived, rapidly changing, and micro biologically dynamic zone of soil surrounding a germinating seed (Eric, 2004). Over the millennia, plants and the seeds they produce have evolved in association with a diversity of microorganisms. These associations may occur as the seed develops and matures (Garbagnoli, 1999; Bacillo-Jimenez, 2001; Girish, 2001; and Kanivets, 2001) or during dormancy and germination in soil. These spermosphere associations are either beneficial or harmful to plant growth, development, and health (Eric, 2004). Spermosphere was first mentioned by Slykhuis in 1947. He defined this region as the 'spermatosphere', being aware Eric (2004) the microbiological uniqueness of this region and speculating that the spermatosphere was of particular importance in regulating the activities of seed and seedling pathogens. The concept of the spermosphere was fully developed by Onorato Verona, and defined as the Spermosphere is the zone of elevated microbial activity around a germinating seed (Verona, 1958). Despite the slow progress over the past decades, the spermosphere is recognized today as a dynamic site of microbial interactions, governed largely by the nature and flux of materials released from seeds during germination.

As observed the seeds of *C. argentea* were dormant and in general they will not germinate earlier than 12 months of dry storage. Mechanical as well as chemical scarification with concentrated sulphuric acid could not break the seed dormancy and initiate germination. Even under the continuous washing with water for 24 h there was no germination, which is an

Indication for the probable absence of water soluble inhibitors. But the seeds were germinated in the concentrations of 0.35 N HCl (Table 1). The seeds of *C. argentea* also germinated very well with gibberellic acid treatments (50 ppm) (Saritha, 2010). The fungal genera capable of producing the plant growth regulators are *Alternaria*, *Aspergillus*, *Fusarium*, *Gibberella*, *Penicillium*, *Rhizopogon*, *Rhizopus* and *Sphaceloma* (Subba Rao, 1977). GA3 was extracted from fungal cultures. (Hapkins, 2004). Hence, these observations were initiated to explore the involvement of spermosphere microorganisms on seed germination of *C. argentea*.

The seeds were not germinating in lab conditions, but it may germinate easily in the natural fields. Therefore spermosphere microorganisms were isolated from the *Celosia argentea* L. After the growth of microorganisms in the liquid medium, the value of the pH was fallen by the production of the acids from the microbes into the medium. As such the seeds of *Celosia argentea* will germinate innumerable numbers in acidic pH made of soil microorganism without undergoing dormancy.

From the results obtained, it was clear that the seeds of *Celosia argentea* possess 'seed coat dormancy'. As in the case of hard seed coat containing plant species like *Sapindus*, *Tamarindus*, etc., which germinates after hot water treatment and or sulphuric acid treatments in laboratory conditions. But in natural conditions seed germination occurs only after the break down of hard seed coats of seeds by the physical or physiological degradation by the action of micro organisms.

## CONCLUSION

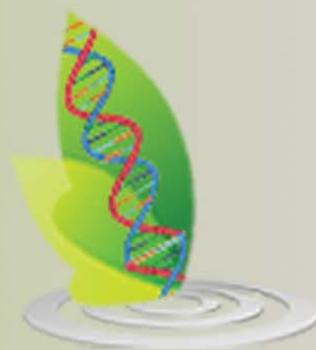
In the present investigation it can be concluded

that the hard coated seeds of *Celosia argentea* L. exhibit multifactorial germination. These seeds were germinating in acidic conditions of the soil medium released by soil microorganisms in natural soils.

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