



STUDIES ON ECOLOGY OF *C. argentea* L.

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ABSTRACT

Celosia argentea L. is one of the most dominating herbaceous annual weed found in all semi arid land crops. In order to eradicate the weed phytosociology, seed output, multifactorial germinability, biodegradation, its Allelopathic effects on surrounding crop plant seed germination & on microorganisms has been studied. Only *Alternaria alternata* was found to cause a minor leaf spot disease of weed. Potassium chloride (at 1% concentration), 2, 4-D (2% concentration) had herbicidal effects within three days. And causes decolouration, defoliation and wilting of leaves and also complete drying of plants.

Keywords: *Celosia argentea* L, Phyto Sociology, Dormancy, Germination, Sphermsphere, Allelopathy, Bio-herbicides, Biodegradation.

INTRODUCTION

The presence of weeds on cropland result in Competition and yield reductions, loss in crop quality, added protection costs from pests, increased costs of labour and equipment, increased water management problems, lower land value etc. Hence, there is a need to study the ecology and reciprocal relations of weeds and crops as thoroughly as possible.

According to Holm [1, 2], seven species of Amaranthaceae members were considered as worlds worst weeds. It occupies 65% in the world. *Celosia argentea* L. is one of the most dominating herbaceous annual weed belongs to the family Amaranthaceae found in all semiarid land crops like *Arachis hypogaea*, *Raphanus sativus*, *Sorghum bicolor*, *Dolichos lablab*, *Vigna unguiculata*, *Cajanus cajan*, *Phaseolous aureus*.

Ecology

It is an erect plant & grows to a height of 1.0-1.6m under favorable conditions [2]. *Celosia* grows well in the lowland humid forest zone at day temperatures of 30–35°C and night temperatures of 23–28°C and at an altitude up to 1700 m. Growth is greatly retarded by temperatures below 20°C. *Celosia* performs well under partial shade, especially in dry conditions. Photosynthesis in *celosia* follows the C₃-cycle pathway; The rainfall requirement

during the rainy season is 500–1000 mm [3].

Phyto sociology of *C. Argentea*

Phyto sociological studies of *Celosia argentea* revealed its associates in crop fields as well as in wastelands of Chittoor district. In the present study the frequency, abundance, density, relative frequency and relative density of *Celosia argentea* and its associates were studied as per Misra [4-6]. These observations revealed the sociability and successful establishment of *Celosia argentea* in terms of Darwinian concept [7].

Germinability

The weed *Celosia argentea* produced a maximum number of seeds 17,340 per plant during rainy season and it supports its widespread nature in the crop fields. *Celosia argentea* exhibit dormancy in the laboratory. The average volume of the seed was found to be 0.003 ml/ seed. The 1000-seed weight is 1.0–1.1 g. seed lenticular, 1-1.5mm long, black and shining. It has seed coat dormancy & embryonic dormancy.

The hard coated seeds of *Celosia argentea* L. exhibit multi factorial germination. Lower concentrations of the GA₃, were more effective on seed germination of *Celosia argentea* L. [8]. Many writers have implied that GA₃ stimulates seed germination via amylase

activity Allelopathic chemicals exudated by weeds and other plants. The growth of microorganisms increased as the Several bacteria, actinomycets and fungi are known to produce gibberellins or gibberellin-like substances [9]. These spherosphere microorganisms were affected by concentration of *C. argentea* shoot leachates increased. Hence, it may be assumed that the continuous association of *C. argentea* which is a weed in the crop fields may reduce the yield by promoting growth of microorganisms [10]. Hence forth it clear that the dormant seeds of *Celosia argentea* L could germinate in acidic conditions of the soil medium released by soil microorganisms in natural soils [11]. Allelopathic effects of *C. argentea* L has succeeded in suppressing the yields of cereal crops by promoting the growth of microorganisms. The 1%, 2%, 3% and 5% of aqueous root and leaf extracts of *C. argentea* have considerably inhibited the seedling growth of *Arachis hypogaea*, *Sorghum bicolor*, *Dolichos lablab*, *Vigna unguiculata*, and *Phaseolous aureus* [12].

Being weeds, we should not think lighter; it is very difficult to eradicate or even to establish under specified situations. Unless and otherwise if we know the characteristics of weeds say biology, ecology, distribution, competitions etc; it is a difficult task to give control measures or on the other side to bring up the crop yields [13].

Herbicidal/ chemical / Biological control

2% 2,4-D and 1% Potassium chloride are found to induce many physiological changes observed like decolouration, defoliation and wilting of leaves .The net result is the death of the plant. The mode of action of contact herbicides is the weakening and disorganization of cellular contents by leakage of cellular contents. Under warm and moist conditions 2, 4-D persists for only 2-3 weeks. 2, 4-D is degraded by microorganisms of the genera *Pseudomonas*, *Achromobacter*, *Flavobacterium*, *Cornebacterium*, *Arthrobacter* & *Sporocytophaga*. and are capable of breaking the organic herbicide molecule resulting in deactivation of the compound. Postassium chloride is a naturally occurring mineral that is an excellent

source of the plant nutrient. Potassium is needed for protein and enzyme synthesis and activation. It involved in maintaining proper water balance and also needed for photosynthesis. So potassium chloride is used as a nutrient fertilizer [14].

Phyllosphere microflora of *Celosia argentea* is weak pathogenic and not host specific and also found from various other hosts. They do not cause any disease on the plant. Only *Altenaria alternata* was found to cause a minor leaf spot disease of weed [15]. They do not damage the host tissue due to less virulence. However, if some strain of any of these fungi is developed which meet the requirements of using them as bio-control agents viz., host specificity, strong virulence. So they can be considered as bio-herbicides for bio-control of *C. argentea* L [16].

Degradation

The stem material of *C. argentea* was degraded by soil microorganisms, within 6 months. The stem got complete degradation due to microbial succession by *Fusarium oxysporum*, *Aspergillus niger*, *Curvularia lunara*, *Penicillium notatum*, *Rhizopus nigricans* and *Bacillus Subtilis* [17]. Organic matter provides nutrition to plants & it is essential for soil aeration and rooting habit of plants. Organic matter helps in the conservation of soil nutrients by preventing erosion and surface run – off of nutrients. The decomposition products of plant residues in soil may become toxic to growth of plant under certain conditions. If degradation may not occur properly, the Plant debris in soil may become toxic to growth of plant. It affects the germination of the seed and overall growth of plant [18].

CONCLUSION

The production of seeds in large numbers, huge seed banks, high reproductive capacities, dormancy to withstand severe summers and synchronizing the timing of germination with that of crops indicated that *Celosia argentea* is at an adaptive advantage and make it a successful weed in the semiarid crop fields of Chittoor district.

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