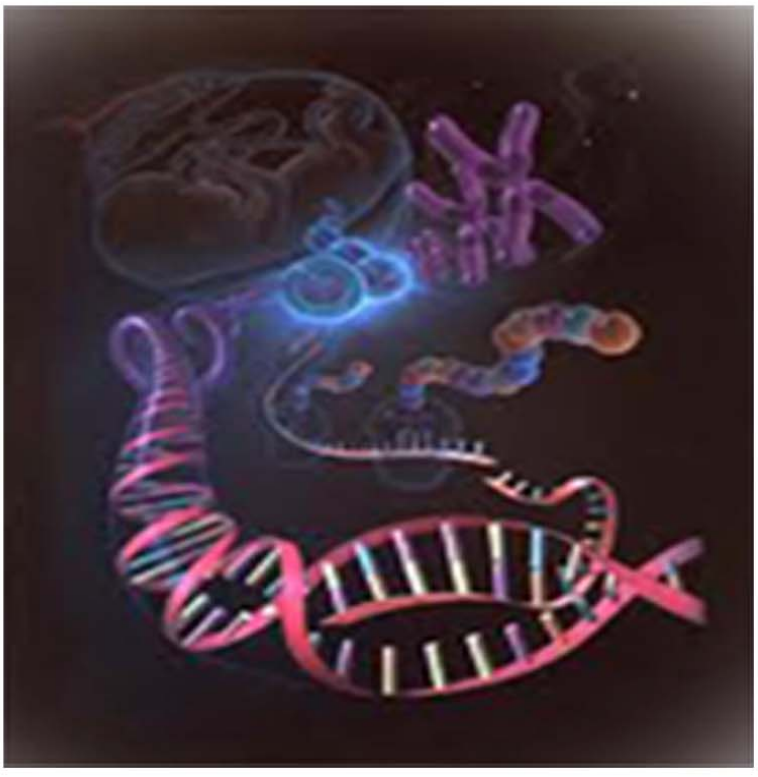
IJLBPR

ISSN 2250 - 3137
Vo1. 2, No. 1, January 2013

International Journal of

Life Sciences Biotechnology and Pharma Research



International Journal of Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA

www.ijlbpr.com

Email : editorijlbpr@gmail.com or editor@ijlbpr.com

International Journal of Life Sciences Biotechnology and Pharma Research

ISSN 2250-3137 www.ijlbpr.com
Vol. 2, No. 1, January 2013

Research Paper

MICROBIAL SUCCESSION ON *CELOSIA ARGENTEA* L. STEMS IMMERSED IN GARDEN SOIL

P Saritha[1*] and A Sreeramulu[1]

Corresponding Author:* ***P Saritha,* ✉ *sarithapendlikatla@gmail.com*

Celosia argentea L. a local weed common in rain fed crop plants of Andhra Pradesh. Microbial association with decomposition was studied in the semi arid fields of Chittoor District. Microbial succession on the stems of *Celosia argentea* L in soil at different time intervals was carried out in laboratory conditions by serial dilution methods. Soil extracts Agar media and Martin Rose Bengal Agar media were used to isolate and enumerate the bacteria and fungi from the stem bits. After one month of immersion of the stem (4 cm × 0.5 cm) in the soil, *Aspergillus niger, Fusarium oxysporum* were isolated. *Aspergillus niger, Bacillus subtilis, Curvularia lunara, Fusarium oxysporum, Penicillium notatum*, and *Rhizopus nigricans* were continued to grow around the stem bits after six months and caused complete degradation of the stem bits. The stem got crushed due to mycological succession.

Keywords: Biodegradation, *Celosia argentea* L., mycological Succession

INTRODUCTION

The selection and development of sequential microbial populations in natural or disturbed systems is known as microbial succession (Darryl Martino, 1999). This succession occurs largely because the activities such as degradation, composting by initial populations of micro organisms bring about changes in their environment. Macdonald *et al*. (1981) noted that the composting process was brought about by several organisms such as bacteria, fungi, actinomycetes and protozoa and may also involve invertebrates. Once the microbial degradation has been stimulated to a certain level, the faunal effect will become quantitatively important (Tian *et al*.,1995). Singh (1987), however, noted that the sole agents of decomposition of carbonaceous materials are the heterotrophic micro organisms. Degradation means decay and bio refers to the life being carried out by living organisms. These living organisms eat the dead material and recycle it into new forms. Biodegradation is the natural process involved in recycling waste or breaking down organic matter into nutrients that can be used by other living organisms (Diaz, 2008).

With this background, in this paper an effort was made to explore the process of microbial succession on degrading stems of *Celosia argentea* L.

[1] Department of Botany, S V University, Tirupati, AP 517502.

MATERIALS AND METHODS

Celosia argentea, (4 cm × 0.5 cm) was collected from cultivated fields and these stem bits were kept in the soil up to six months period. Biodegradation of *Celosia argentea* in soil at different time intervals was carried out in laboratory conditions by serial dilution methods (Martin, 1950).

Serial dilutions were made with sterile water in sterilized test tubes. 10ml, 9ml, 9ml and 9ml of de ionized water was poured into the test tubes respectively. All the test tubes were kept in a autoclave at 15lbs pressure for 15 min. The partially degraded stem bits after immersion in garden soil was transferred into 10ml of sterile water to get 10^{-1} dilution. After the preparation from this dilution further serial dilutions made up to 10^{-4}. 0.2ml of each diluent was poured in sterile petri plate Medium was poured over it. Soil extract agar media and Martin Rose Bengal agar media was prepared and used to isolate and enumerate the bacteria and fungi from the stem bits (Aneja, 2003). Bacteria were isolated after two days growth. Fungi were isolated after four to five days growth.

RESULTS

After one month of immersion of the stem in the soil, *Fusarium oxysporum, Aspergillus niger* were isolated. In the second month, *Bacillus subtilis* bacteria developed along with the existing two microorganisms. After third month, *Penicillium notatum* was grow an around the stem bits. All the six species viz *Aspergillus, Fusarium, Rhizopus nigricans, Penicillum notatum, Curvularia lunara* and *Bacillus subtilis* continued to grow after fourth, fifth and sixth months and caused complete degradation of the stem bits. The stem got crushed due to mycological succession.

DISCUSSION

As well as microorganisms involved degradation which is a long process, but in the laboratory conditions, it is too slow. It takes between 6 and 7 months to complete. During the composting period, labile carbon (C) compounds were lost, while more complex substances, such as humic acids, were synthesized (Riffaldi *et al*., 1992). While soil microorganisms in general take part in humus formation, some fungi such as *Penicillium. Aspergillus* and also *Actinomycetes* produce dark humus like substances (amino acids, peptides and polyphenols) which serve as structural extracts of spores of *Aspergillus niger* posses properties similar to those of humic acids (Subba Rao,1999).

The process of organic matter decay in the soil begins with the decomposition of sugars and

Table 1: Showing Mycological Succession in the Serial Dilutions After Different Time Interval

S. No.	Name of the Fungi	One Month	Two Months	Three Months	Four Months	Five Months	Six Months
1	*Aspergillus niger*	+	+	+	+	+	+
2	*Bacillus Subtilis*		+	+	+	+	+
3	*Curvularia lunara*		-	-	-	+	+
4	*Fusarium oxysporum*	+	+	+	+	+	+
5	Penicillium notatum		-	-	+	+	+
6	*Rhizopus nigricans*		-	+	+	+	+

starches from carbohydrates, which break down easily as detritivores initially invade the dead plant organs, while the remaining cellulose and lignin break down more slowly (Berg and McClaugherty, 2007) Simple proteins, organic acids, starches and sugars break down rapidly, while crude proteins, fats, waxes and resins remain relatively unchanged for longer periods of time. Lignin, which is quickly transformed by white-rot fungi, (Levin *et al*., 2002) is one of the main precursors of humus, (González-Pérez *et al*., 2008). Together with by-products of microbial (Knicker, and Almendros, 1995). And animal (Muscoloa and Bovalob, 1999) activity. The end-product of this process, the humus, is thus a mixture of compounds and complex life chemicals of plant, animal, or microbial origin that has many functions and benefits in the soil. The size of particles of microorganisms involved, the extent of availability of C,N,P and K, the moisture content of soil, its temperature, pH and aeration, presence of inhibitory substances (such as tannins) etc. are some of the major factors which influence the rate of organic matter decomposition (Subba Rao,1999).

Bacteria constitute the most abundant group of microorganisms. In normal fertile soils, 10-100 million bacteria are present per gram of soil. This figure may increase depending on the organic matter content of any particular soil. The bulk of soil bacteria are heterotrophic and utilize readily available source of organic energy from sugars, starch, cellulose and protein. Actinomycetes grow on complex substances such as keratin,chitin and other complex polysaccharides and thus play an active role in humus formation. Soil fungi are mostly heterotrophs. Sporulating fungi such as *Mucor,Penicillium* and *Aspergillus* appear on agar plates rather profusely than non-sporulating ones. Soil algae in cultivated soils vary greatly in numbers and may contribute a small amount of organic matter decomposition. The end products of decomposition are CO_2, H_2O, No_2, So_2, CH_4, NH_4, and H_2S depending on the availability of air.

Organic matter is a natural substrate for saprophytic microorganisms and provides nutrition to plants indirectly through the activity of soil microorganisms. It is essential for the formation of soil aggregates and hence soil structure which ultimately determines the extent of 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. The absence of satisfactory extraction procedures and bioassay methods have come in the way of identifying the nature and extent of phytotoxic principles produced by plant remains which undergo decomposition. They have been detected through seed germination tests, growth of radicles and seedling injury under laboratory conditions which have been supported by field observation like stunted overall growth of plant, chlorosis, slow maturation, premature leaf abscising and failure of flowering and seed setting.

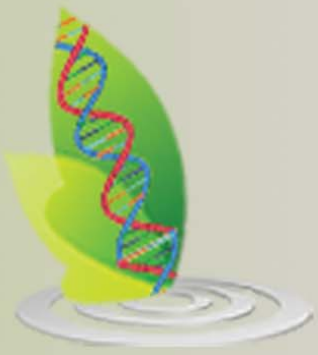
If degradation may not occur properly, the plant debris in soil may become toxic to growth of plant. It affects the germination of the seed and overall growth of plant.

CONCLUSION

In the present investigation, the stem material of *Celosia argentea* L 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.*

REFERENCES

1. Berg B and McClaugherty C (2007), *Plant litter: decomposition, humus formation, carbon sequestration*, 2nd Edition, Springer, p. 338, ISBN 3540749225.
2. Diaz E (Ed.) (2008), Microbial Biodegradation: Genomics and Molecular Biology, 1st Edition, Caister Academic Press, http://1800recycling.com/green-glossary/b/biodegradation.
3. Darryl Martino (1999), "Study of microbial succession and its impact on Global Biogeochemical cycles", 1999 princeton Rutgers Environmental Science Institute.
4. Levin L, Forchiassin F and Ramos A M (2002), "Copper induction of lignin-modifying enzymes in the white-rot fungus Trametes trogii", *Mycologia,* Vol. 94, pp. 377-383 [2]
5. González-Pérez M, Vidal Torrado P, Colnago L A, Martin-Neto L, Otero X L, Milori D M B P, and Haenel Gomes F (2008), "^{13}C NMR and FTIR spectroscopy characterization of humic acids in spodosols under tropical rain forest in southeastern Brazil", *Geoderma*, Vol. 146, pp. 425-433, doi:10.1016/j.geoderma.2008.06.018
6. Knicker H, Almendros G, González-Vila F J, Lüdemann H D and Martin F (1995), "^{13}C and 15N NMR analysis of some fungal melanins in comparison with soil organic matter", *Organic Geochemistry,* Vol. 23, pp. 1023-1028, doi:10.1016/0146-6380(95)00094-1
7. Macdonald Dow MGC and Griffin Shay E (1981), "Returning wastes to the land", in *food, fuel and fertilizer from organic wastes*, *Report of ad hoc panel of the advisory committee on technology for international development commission on international relations*, National Research Council, National Academy Press, Washington DC.
8. Martin J P (1950), "Use of acid, rose Bengal and streptomycin in the soil plating method for estimating soil fungi", *Soil Sci.,* Vol. 69, p. 215.
9. Martins V A P *et al*. (2008), "Genomic Insights into Oil Biodegradation in Marine Systems", *Microbial Biodegradation: Genomics and Molecular Biology*, Caister Academic Press.
10. Muscoloa A, Bovalob F, Gionfriddob F and Nardi S (1999), "Earthworm humic matter produces auxin-like effects on Daucus carota cell growth and nitrate metabolism", *Soil Biology and Biochemistry,* Vol. 31, pp. 1303-1311, doi:10.1016/S0038-0717(99)00049-8.
11. Riffaldi R, Levi-Minzi R, Saviozzi A and Capurro M (1992), "Evaluating garbage compost", *Biocycle,* Vol. 33, pp. 66-69.
12. Singh C P (1987), "Preparation of High grade Compost by an Enrichment on Organic Matter Decomposition", *Biol. Agric. Hort*., Vol. 5, pp. 41-49.
13. Subba Rao N S (1999), "Soil microbiology", Fourth edition of soil microorganisms and plant growth, Oxford & IBH publishing co.pvt. Ltd., New Delhi.
14. Tian G, Brussaard L, Kang BT (1995). "Breakdown of plant residues with contrasting chemical compositions under humid tropical conditions: Effects of Earthworms and Millipedes", *Soil Biol. Bio chem*., Vol. 27, pp. 277-280



International Journal of Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlbpr@gmail.com or editor@ijlbpr.com
Website: www.ijlbpr.com