Preliminary screening of fungal pathogens of *Xanthium strumarium* for Eco-friendly management in Raipur

Kumari Kalindi [1], Dr. Sushma Dubey[1*]

Department of Biotechnology Kalinga University Naya Raipur Chhattisgarh,Pin 492101 India

Abstract: Xanthium strumarium is a common annual weed spread by water, humans, or other animals. Its origin is still being debated, but cocklebur may be a native California species. It is most abundant on moist open sites but is present on a variety of waste places. In Raipur periodic survey of various forest location was conducted. ***X. strumarium*** plant or leaves with disease symptoms were collected and all the emergent fungi were isolated A total of 12 fungal pathogens were isolated and identified from various disease samples of *X.strumarium*. about 12 fungal isolates were recovered from this weed. Amongst them, maximum damage to the test plants was caused by *Curvularia lunata* FCXS#07. phyto-toxicity of *Curvularia lunata* FCXS#07found to be the most virulent strain, so, it was selected as a biological agent for the management of the noxious weed ***X. strumarium***.

Key Words: Xanthium strumarium, fungal pathogens, Die back, Leaf blight, Leaf spot.

Introduction

Xanthium strumarium is a common annual weed spread by water, humans, or other animals. Its origin is still being debated, but cocklebur may be a native California species. It is most abundant on moist open sites but is present on a variety of waste places. Cocklebur is toxic to certain animals. It reproduces from seeds that are viable for up to several years.

Animals eat young plants which are toxic, and can be poisoned if they consume them in sufficient quantity and die after ingesting this plant. In Western literature, xanthium is not described as a medicinal herb, but is a well-known toxic herb (rated as highly toxic) for grazing animals (Dharmananda *et.al*.,2003). It has been recognised to cause losses in cattles, (Martin *et.*

*al.,*1986, Oelkers *et. al*., 1982) horses, goats, pigs, sheep, (Oelkers *et.al*., 1982, Burrows *et.al.,*199, Stuart *et.al*.,1981) swine and diminished weight gain in poultry. (Goodwin et. al., 1992) The plant produces allergic contact dermatitis in susceptible humans.

Germination of cocklebur seeds has been extensively researched. (Zimmerman 1983) More than 80% of cocklebur seeds are viable in most populations. Seeds of *Xanthium strumarium* have a high moisture requirement for germination and show little germination in soils at less than 75% of field capacity, but they are able to absorb moisture at high osmotic concentrations.

Materials and Methods

Field survey: A systematic and thorough survey of various location of Raipur (Kharora,Aarang,Uperwara,Dhamni), infected with *Xanthium strumarium*. After collection, specimens were brought to the laboratory of the specimens were done and collected samples were carefully examined under microscope.

Isolation from plant sample: infected parts of the weed were surface sterilized with .05% NaOCl for 3 minutes and then washed with sterilized distilled water and then cut into small pieces then transfer to PDA Plates (Agrawal and Hasija 1986). These petri-plates were incubated at 28^{o}C in BOD incubator for three to five days.

Microscopic studies: Identification of fungi was done after studying the morphological and cultural characteristic with the help of manuals monographs and papers of various workers. Identification of isolated of fungi was made on the basis of the morphological characteristics with the help of available literature (Subramaniam 1971; Barnet and Hunter 1972; Ellis 1971, 76; Ellis and Ellis 1985'; Sutton 1980).

Pathogenecity and selection of virulent strain:

a. Preparation of Cell Free Culture Filtrate:

500 ml Erlenmeyer flasks containing 250 ml of pre-sterilized fermentation medium i.e. Richard's Broth was seeded with 5mm discs separated by sterilized cork borer from 10 days old vigorously growing culture on PDA medium at 28±1°Cana BOD incubator (Remi, India). Inoculated flasks were incubated at in a BOD incubator for 7, 14, 21 and 28 days.

b. Extraction of Cell Free Culture Filtrate:

Under aseptic conditions, the metabolized broth was filtered through a preweighed whatman filter paper no. 1 and was centrifuged at 4000 x g for 15-20 min (Vikrant *et al*., 2006). The pellet was thrown and the supernatant was re-filtered in vacuo by microfiltration using sterile' microfilters, 0.45 μm, Minisart (Sartorius, Gottingen, Germany) to obtain crude culture filtrate (Walker and Templeton, 1978).

c. General Bioassays:

Whole plants bioassay: Four-to six-week old plants having 4-8 leaves were grown in tubs with illumination of 12 hr daily for 1 week for acclimatization under laboratory conditions. These were then sprayed with FCFC of different concentration. Ten replicates were used in the experimental as well as in the control set. The control set received only sterile distilled water. Plants were observed daily for the disease severity according to Chiang et al. until all plants died. The experiment was repeated thrice.

Results.

The collected diseased *X.strumarium* plant revealed the presence of leaf spot, petiole rot, leafe blight disease. A total of 12 fungal pathogens were isolated and identified from various disease samples of *X.strumarium*. viz., *Alternaria alternate* FCXS#06, *A. tenuissima* FCXS#12, *A. triticola* FCXS#02, *Cercospora xanthi strumari* FCXS#04, *Curvularia lunata* FCXS#07, *Oidium xanthii* FCXS#10, *Periconia xanthicola* FCXS#09, *Puccinia xanthii Schw* FCXS#05, *Bortrytis cinera* FCXS#03, *Fusarium moniliformae* FCXS#11, *F. oxysporum* FCXS#01 and *Arthrinium puccinoides* FCXS#08 , were recovered from various parts of X. strumarium. Maximum infection was observed in the Leaf along with the expression of minimum symptoms.(Table 1).

On the bases of whole plant bioassay Out of 12 identified fungi *Curvularia lunata* FCXS#07 had found highest virulent followed by *A. tenuissima (*FCXS#12*), Alternaria alternate(*FCXS#06*) and A. triticola(*FCXS#02*)minimum infection and caused mild damage to X.strumarium while few others, viz., Bortrytis cinera (*FCXS#03*), Fusarium moniliformae (*FCXS#11*)and F. oxysporum (*FCXS#01*).* Biological control using plant pathogens has shown

substantial impact on the weed. In Raipur periodic survey of various forest location was conducted. ***X. strumarium*** plant or leaves with disease symptoms were collected and all the emergent fungi were isolated and about 12 fungal isolates were recovered from this weed. Amongst them, maximum damage to the test plants was caused by *Curvularia lunata* FCXS#07. Contradictory to many reports by various other workers, (Nagraj and Ponappa, 1967; Charudattan and Rao, 1982; Shabana *et al*., 1995a and b; Shabana *et al.,* 2000a and b; Molo and Ogwang, 2001; Hubbali *et al.,* 2010; Pathak and Kannan, 2011).

Table No.1 - Fungal pathogens isolated from *X. strumarium*

S.No.	Pathogen	Isolate No.	Infected Part
1	*Alternaria alternata*	FCXS#06	Leaf, stem, seed
2	*A. tenuissima*	FCXS#12	Stem, seed
3	*A. triticola*	FCXS#02	Leaf
4	*Cercospora xanthi strumari*	FCXS#04	Leaf
5	*Curvularia lunata*	FCXS#07	Leaf, seed
6.	*Oidium xanthii*	FCXS#10	Seed, Leaf
7.	*Periconia xanthicola*	FCXS#09	Stem, leaf
8.	*Puccinia xanthii Schw*	FCXS#05	Stem, seed
9.	*Bortrytis cinera*	FCXS#03	Leaf
10.	*Fusarium moniliformae*	FCXS#11	Stem, leaf
11.	*F. oxysporum*	FCXS#01	Leaf
12.	*Arthrinium puccinoides*	FCXS#08	Leaf, seed

FCXS- Fungus culture *Xanthium strumarium*.

Table No.2 Pathogenicity of fungal pathogens on *X. strumasium*

S.No.	Pathogen	% Mortality	Disease index
1	*Alternaria alternata*	90.5	4
2	*A. tenuissima*	91	4
3	*A. triticola*	85	4
4	*Cercospora xanthi strumari*	60	3
5	*Curvularia lunata*	95	4
6.	*Oidium xanthii*	20	1
7.	*Periconia xanthicola*	40.5	2
8.	*Puccinia xanthii Schw*	50	2
9.	*Bortrytis cinera*	45	2
10.	*Fusarium moniliformae*	10	1
11.	*F. oxysporum*	15	1

12.	*Arthrinium puccinoides*	30	2

Conclusion : Studies conducted indicate and all observations show the frequency and phyto-toxicity of *Curvularia lunata* FCXS#07found to be the most virulent strain, so, it was selected as a biological agent for the management of the noxious weed ***X. strumarium***.

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