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Pathology

ECOPATHOLOGICAL OBSERVATION IN *GLYCINE SOJA* SIEB. & ZUCC. GROWN IN KUMAUN HILLS

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ABSTRACT *Glycine soja* Sieb. & Zucc. is one of the principle leguminous crop in Kumaon region. During an extensive survey through the important growing areas, the crop was seen infected with several fungal diseases during last few years. Five fungal pathogens viz. *Alternaria alternata, Cercospora abelmoschi, Erysiphe cichoracearum, Helminthosporium nodulosum and Phoma hibernica* were identified. *Cercospora abelmoschi* caused maximum loss (91.22%) in chlorophyll content of leaves of infected plants. *Phoma hibernica* showed well marked reduction in productivity measuring (89.74%). It also caused very high respiratory loss (2.9 gm/m2/hr). The present study reveals that the pathogenic fungi affect the process of chlorophyll synthesis as well as existing chlorophyll pigment.

KEYWORDS : Ecopathological, Fungus, Chlorophyll, Productivity Etc.

INTRODUCTION

Wild soybean (*Glycine soja* Sieb. & Zucc.), the wild ancestor of cultivated soybean [*Glycine max* (L.) Merr.] is widely distributed in Japan, Korea, China including Taiwan, and Eastern Russia (Hymowitz and Singh, 1987). Soybean is the world's most important seed legume, which contributes to 25 % of the global edible oil, about two-thirds of the world's protein concentrate for livestock feeding. Soybean meal is a valuable ingredient in formulated feeds for poultry and fish. The protein of soybean is called a complete protein. In India, Soybean was introduced from China in tenth century AD through the Himalayan routes, and also brought in via Myanmar by traders from Indonesia. As a result, soybean has been traditionally grown on a small scale in Himachal Pradesh, the Kumaun Hills of Uttarakhand, eastern Bengal, the Khasi Hills, Manipur, the Naga Hills, and parts of central India covering Madhya Pradesh. It has also been reported that the Indian continent is the secondary center for domestication of the crop after China (Singh and Hymowitz 1999, Agrawal et al. 2013). Pathogenic fungi influence the growth of host plant body by checking or by interrupting physiological activities. In the late 1970s, 10% of the entire soybean population in Ohio was destroyed by the pathogens (Dorrence et al. 2007). Rust, smut, rot, spot and wilt occur on the leaves and stem of soybean (Bhosale et al. 2014).

There occur a number of biochemical changes in host plants brought about by pathogenic organisms. The present work was undertaken to find out the effect of pathogenic fungi on chlorophyll and productivity of *Glycine soja*.

MATERIALS AND METHODS

Study Area:

Present study was carried out in the state Uttarakhand, district Nainital at Bhimtal in the year 2019. For present investigation diseased plant part of host were collected from different location of wild soybean crop field in the monsoon season from July to October. Wild soybean is cultivated during kharif crop.

Identification & Methodology:

The healthy and diseased leaves were collected in polythene bags in the morning. Identification and confirmation of pathogen was done by standard methods. The productivity is measured by leaf disc methods (Mishra et.al.1963) and chlorophyll content was determined by method of (Upadhyay and Dwivedi 1979).

RESULT & DISCUSSION

The types of pathogenic fungi and their effect on host plant are summarized in Table 1 & 2. The maximum loss of total chlorophyll content was due to *Cercospora abelmoschi* (91.22 %) (Table-1). A considerable reduction in amount of chlorophyll may be due to destruction of pigment in mature chloroplast by pathogen as reported by various workers (Joshi et al. 1984, Omari at al. 2001, Sowden et al. 2018, Kretschmer et al. 2019) or due to metabolic destruction rather than direct destruction by the pathogen (Padmanabhan et.al 1974). Rate of respiration in infected plant is very high than that of healthy plant (Table-2). Maximum loss of net production was recorded in *Phoma hibernica* (91.89 %) infection due to highest rate of respiration (2.5 gm/m^2/hr) as comparison to the healthy plant. Wild soybean disease caused by fungus is important because resulting yield losses decrease the quantity and quality of grain grown for food and feed (Allen 2017).

Table 1- Loss In Chlorophyll Of *Glycine soja* By Different Pathogenic Fungi:

Pathogenic fungi	Loss in total chlorophyll mg/g	% loss in total chlorophyll
Healthy	5.7	---
Alternaria alternata	3.3	42.11
Cercospora abelmoschi	0.5	91.22
Erysiphe cichoracearum	2.4	57.89
Helminthosporium nodulosum	1.5	73.61
Phoma hibernica	1.6	71.91

Table 2- Loss In Productivity Of *Glycine soja* By Different Pathogenic Fungi

Pathogenic fungi	Net production gm/m^2/hr	Respiratory loss (gm/m^2/hr)	% loss in net production
Healthy	3.7	0.7	---
Alternaria alternata	2.0	0.9	45.94
Cercospora abelmoschi	0.8	1.8	78.37
Erysiphe cichoracearum	0.5	2.0	86.48
Helminthsporium nodulosum	1.1	1.3	70.27
Phoma hibernica	0.3	2.5	91.89

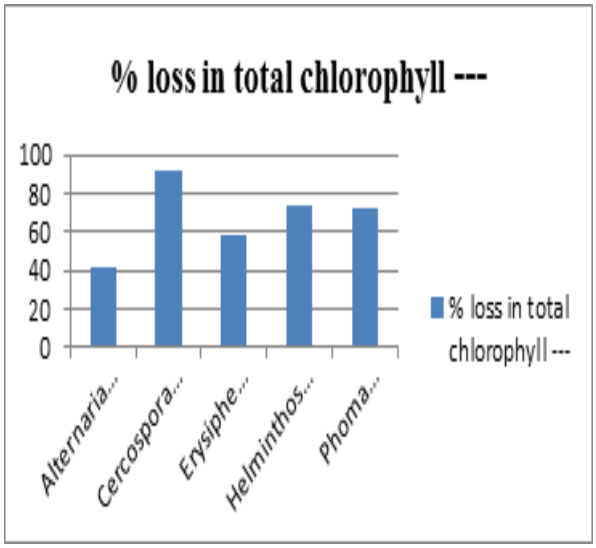

Figure 1: Loss In Chlorophyll Of *Glycine Soja* By Different Pathogenic Fungi

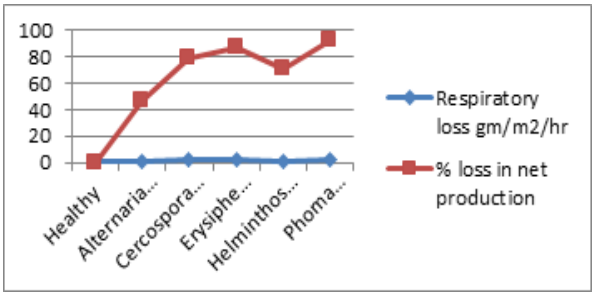

Figure 2: Loss In Productivity With Respiration Loss Of *Glycine soja* By Different Pathogenic Fungi

CONCLUSION

A considerable reduction in amount of chlorophyll may be due to destruction of pigment in mature chloroplast. Loss of productivity in host plant is probably due to high rate of respiration and reduced rate of photosynthesis on account of the loss chlorophyll pigment. The present study reveals that the pathogenic fungi affect chlorophyll synthesis as well as existing chlorophyll pigment.

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