Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 2343-2344
Received: 16-05-2019
Accepted: 18-06-2019

Satish Kumar
Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana, India

SS Karwasra
Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana, India

Correspondence
Satish Kumar
Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana, India

Influence of stripe disease on biochemical parameters of barley

Satish Kumar and SS Karwasra

Abstract
Stripe disease of barley caused by *Drechslera graminea* (Rabenh.) Shoemaker is a widely distributed disease in many barley grown parts of the world, but it has assumed more importance with the introduction of some new high yielding varieties. The present investigations were undertaken during 2007-08 and 2008-09 crop seasons with a view of elicit information on effect of disease on biochemical and physiological parameters particularly *in vitro* dry matter digestibility, protein content, malt extract, *In vitro* dry matter digestibility (IVDMD) decreased and total protein (%) increased in barley plants having disease, while malt extract (%) was more in grains collected from healthy plants.

Keywords: Barley, stripe disease, IVDMD, total protein, malt extract

Introduction
Barley (*Hordeum vulgare* L.) is an important cereal crop in the world, ranking next to maize, wheat and rice. It is one of the earliest domesticated food crops. In India, it is an important Rabi season cereal crop in Punjab, Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh and Bihar. Total area under this crop in India is 656.25 thousand ha, with a production of 1747.45 thousand tons and an average productivity of 2663 kg/ha in 2016-17. Total area under this crop in Haryana is 20 thousand ha with a production of 73 thousand tones and an average productivity of 3650 kg/ha during 2016-17 (Anonymous, 2018) [1].

Barley is hardier than wheat crop and is inherently equipped to adapt itself admirably well under limited inputs and marginal lands. Because of its most versatile agro climatic adaptability even the high yielding varieties of wheat could not replace barley in the wheat bowls of India on rainfed, saline, alkaline soils and dryland etc. The raw material of barley is utilized for malting and brewing purpose besides food grain and cattle feeds. Barley crop suffers from a number of diseases such as stripe rust, leaf rust, covered smut, loose smut, net blotch, stripe disease and leaf blight etc. which cause significant losses to crop yield. Among these fungal disease, stripe disease (*Drechslera graminea* (Rabenh.) Shoemaker is an important disease which may cause crop loss upto 70-72 per cent under epiphytotic conditions (Pant and Bisht, 1983) [7]. Due to the extensive cultivation of high yielding barley varieties, the problem of stripe disease has assumed a significant importance. The pathogen is seed borne in nature and it survives exclusively as mycelium on peri- carp or hull of the seed. Diseased plant arise only from infected seeds and they become systematically infected, senescence early and produce a poor yield due to shrivelled seed. There is no spread of infection between plants during the growing season. The fungus produces masses of conidia (anamorph of *Drechslera graminea*) on leaves of diseased plants. These conidia are carried by the wind to developing seed on the ear of healthy plants with in the crop and in neighbouring crops. Developing barley seed is susceptible to infection from anthesis to soft dough stage (Teviotdale and Hall, 1976) [8]. Since, some of the spores germinate and infect the developing seed, there is potential for infection to multiply significantly from one season to next season.

The pathogen has been reported as an obligate parasite, and practically no authentic record have been produced yet that conidia are produced on artificial media. But on the other hand, it has been reported that this pathogen successfully sporulates on the lesions on the foliages and glumes under natural conditions.

In Haryana, the disease was first reported by Tyagi (1974) [10] on variety C-138 and in 1976 Harichand further reported on many commonly grown varieties. Disease plant arise only from infected seeds. After the germination of the seed, the pathogen becomes systemic and the plants senesence early and produce poor yield due to the shriveled grains. There is no secondary spread of infection. Since, these conidia germinate and infect the developing seed, so there is potential for the production of diseased seed, which act as source of infection for the next season. Being a seed borne disease, it is observed where the barley crop is grown throughout the world.

Stripe disease incited by *Drechslera graminea* (Rabenh.) Shoemaker is very destructive disease of irrigated barley crop. This disease is very serious throughout the world, wherever barley is cultivated. It is also common in North India, particularly in Haryana and Rajasthan states and causes hugs loss in grain yield. The disease has been reported from Europe, U.S.A, South Africa, Chin and Japan.

Keeping this view in mind, an attempt was made to study the effect of stripe disease on biochemical parameters.

Materials and Methods

The present investigation entitled, "Influence of stripe disease on biochemical parameters of barley" were carried out during 2007-08 and 2008-09 Rabi seasons. The field experiments were conducted at the experimental research area of the Department of Plant Pathology, CCS Haryana Agricultural University, Hisar located at 215.2 M above the mean sea level with a longitude of 75º46'E and latitude of 29º10'N has a wide range of temperature fluctuation during summer and winter seasons and is characterized as a Semi arid Zone. The minimum and maximum temperature ranges from 0ºC to 48ºC, respectively. The annual average rainfall is 430mm. The major part of rainfall is received during monsoon season which occurs from July to September. A few millimeters of rainfall can be expected in winter too. During 2007-08 crop season the diseased plants were selected at the experimental research area, Department of Plant Breeding (Wheat and Barley section), CCS Haryana Agricultural University, Hisar in the seed production area of variety BH-393. At maturity these selected plants were harvested separately, thrashed and the seed obtained was used for carrying out further studies.

Biochemical parameters studies were undertaken as IVDMD (*In vitro* dry matter digestibility), total protein content (%) and malt extract (%).

For determination of *In vitro* dry matter digestibility (IVDMD) and protein content (%) samples of diseased as well as healthy plants of variety BH 393 were collected from the field after the maturity of the crop. Samples were dried, chopped and ground with the help of grinder. The grinded plant material was passed through a fine wire mesh. IVDMD was determined by method of Tilley and Terry (1963) and protein content (%) was estimated by the Microkjedahl's method (A.O.A.C., 1988) [2].

The total malt content was estimated by Micro malting system (Verma *et al*. 2005) [12]. For determination of total malt extract (%) barley grain samples (100 gm each) from healthy plants and diseased plants were taken and malted through automatic micro-malting system (M/s Phoenix systems, Australia). Total malt extract (%) was estimated by the method of (Verma *et al.,* 2005) [12].

Table 1: Effect of stripe disease of barley on biochemical parameters

Parameter	Healthy plants	Diseased plants
IVDMD* (%)	60	47
Total protein (%)	3.76	9.8
Malt extract (%)	75.3	72.5

*IVDMD *(In vitro* dry matter digestibility)

Results

The data revealed that dry matter digestibility was as high upto 60.00 per cent in healthy plants as compared to 47.00 per cent in diseased plants. The total protein content (%) was more in diseased plants i.e. 9.8 per cent while only 3.76 per cent in healthy plants. Malt extract (%) was maximum in the grains obtained from healthy plants i.e. 75.3 per cent in comparison to 72.5 per cent in the grains obtained from diseased plants. So the data in clearly indicate that digestibility of barley plants decreased and total protein (%) increased in barley plants having disease. Whereas, malt extract (%) was more in the grains collected from the healthy plants than the diseased plants. The lignin and silica contents have also been reported to reduce IVDMD (Arora *et al*., 1975; Gandhi *et al*., 1980) [3, 4]. Similarly, Luthra *et al*., (1988) [6] also recorded the decrease in IVDMD (3-4 per cent) in downy mildew infected lucerne leaves. Similar results have also been reported by Wilson *et al*., (1991) [13] that IVDMD decreased significantly in rusted pearl millet leaves.

Obligate parasites /facultative saprophytes subsist mostly on living hosts which may lead to many marked shifts in the metabolic processes of host tissues leading to changes in different metabolism. Fungal infection usually results in drastic changes in biochemical processes of the host (Wood, 1967) [14]. Quantitative and qualitative changes in proteins occurs when a plant cell is penetrated by the pathogen and the origin of proteins is related to both plant and pathogen (Uritani, 1971) [11]. Similarly, slightly reduced in malt extract (%) may be due to the fact that grains become Shrivelled in diseased plants and due to which malt extract (%) was less.

References

1. Anonymous. Ministry of Agriculture and Farmers Welfare, Govt. of India, 2018.
2. AOAC. Association of official Analytical Chemist: Changes in official methods of analysis. Arlington, U.S.A. 71, 14th ed, 1988.
3. Arora SK, Paroda RS, Luthra YP, Das B. Genetic variability in structural components and *in vitro* digestibility of fodder samples of promising grain sorghum. Ind. J Nutr. Dietet. 1975; 12:53-59.
4. Gandhi SK, Luthra YP, Lodhi GP, Chand JN. Note on the influence of date of sowing on the incidence of foliar diseases and their effect on the quality of forage sorghum. Indian J Agric. Sci. 1980; 50:363-366.
5. Harichand. Studies on Helminthosporium diseases of barley in Haryana. M.Sc. Thesis Haryana, Agricultural University, Hisar, India, 1976.
6. Luthra YP, Joshi UN, Gandhi SK, Arora SK. Biochemical alterations in downy mildew infected Lucerne leaves. Indian PhytoPath. 1988; 41:100-106.
7. Pant SK, Bisht KKS. Effect of stripe disease of barley on yield components. Indian PhytoPath. 1983; 36:103-105.
8. Teviotdale BL, Hall KH. Effect of light and temperature on number and length of *Helminthosporium gramineum* conidia produced in culture. Journal of Botany. 1976; 45:644-648.
9. Tilley JMA, Terry RA. A two stage technique for the *in vitro* digestion of forage crops. J Br. Grassland Society. 1963; 18:104-109.
10. Tyagi PD. Barley diseases situation in Haryana during 1973-74. All India Barley Workshop, New Delhi, 1974.
11. Uritani I. Protein change in diseased plants. Ann. Rev. Phytopathol. 1971; 9:211-234.
12. Verma RPS, Sharma RK, Mishra B. Future of barley for malt, feed and Fodder in India. Technical Bulletin. 2005; 9:28.
13. Wilson JP, Gates RN, Hanna WW. Effect of rust on yield and digestibility of pearl millet forage. Phytopathology. 1991; 81:233-236.
14. Wood RKS. Physiological Plant Pathology, Oxford and Edinburg: Blackwell Scientific Publication, 1967, 570.