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Management of Pearl millet through foliar application of cow urine, selective chemicals and botanicals

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Abstract
Pearl millet is a staple cereal grown in India. It encounters number of diseases which attack the crop during its growth, cause low yield and economic loss to the peasant ad finally to the nation as a whole. The blast also referred as leaf spot caused by *Pyricularia grisea* has emerged as a serious disease affecting both forage and grain production in pearl millet. In view of this, the Trifloxystrobin + Tebuconazole @ 0.05% was found most effective as it show minimum PDI followed by Propiconazole @ 0.05%, Tricyclazole (Beam) @0.1%, Azoxystrobin 25 EC @0.05%, Iprobenphos (kitazin) 48 EC @0.1%, cow urine, NSKE, *Allium sativum*, at last *Lantana camera* were as the maximum Blast score (0-9) was recorded in control. The maximum grain was obtained in Tricyclazole, followed Triofloxystrobin+Tebuconazole, Propiconazole, Azoxtstrobin, Iprobenphos (kitazin), NSKE, *Allium sativum*, control, while minimum grain yield was recorded in *Lantana camera* followed by Cow urine. The maximum fodder was obtained in Propiconazole, followed Triofloxystrobin+Tebuconazole, Tricyclazole, Azoxtstrobin, Iprobenphos (kitazin), NSKE, *Allium sativum*, cow urine, while minimum grain yield was recorded in control followed by *Lantana camera*.

Keywords: Cow urine, chemicals, botanicals, *Pyricularia grisea*, pearl millet

Introduction
Pearl millet [*Pennisetum glaucum* (L).*R.Br.*] is an important grain and forage cereal of India which is popularly known as bajra. Pearl millet is the most widely grown staple food crop of majority of poor and small land holders in Asia and Africa. It is consumed as both feed and fodder for livestock. Pearl millet is well modified to grow under most adverse agro-climate conditions characterized by drought, low soil fertility and high temperatures. In India, pearl millet is the fourth most widely cultivated food crop after rice, wheat and maize. It occupies 7.4 million ha with an average production of 9.13 million tones and productivity of 1237 kg/ha during 2017-18 (Directorate of Millets Development, 2019; Project Coordinator Review, 2019) [2]. Madhya Pradesh occupies 0.27 million ha with an annual production 0.59 million tones and productivity is 2203 kg/ha (Anon. 2018) [1]. In India, it is normally cultivated in rainy season as grain and forage crop. The major pearl millet growing states are Rajasthan, Maharashtra, Gujarat, Haryana, Madhya Pradesh, Tamil Nadu, Andhra Pradesh and Karnataka which account for more than 90% of pearl millet acreage in the country and commonly grown on rainy (kharif) season.

Material and Methods
The experimental materials for the present study was laid out in Randomized Block Design (RBD) with three replications during Kharif season, 2017-18 grow at R.V.S.K.V.V. Gwalior, (M.P.). Normal package of cultivation were provided to raise the normal crop.
The management of blast disease under field condition through artificial inoculated after *in - vitro* studies the effective treatments. Selected the nine treatments with control were taken most effective 3 botanicals viz., *Allium sativum*, *Lantana camera* and Neem seed kernel extract, 5 chemicals viz., Iprobenphos, Tricyclazole, Azoxystrobin, Propiconazle and Trifloxystrobin + Tebuconzole and cow urine for evaluation their efficacy by foliar spray against the *Pyricularia grisea* of pearl millet. The first spray was given just after the appearance of the disease and subsequent three spraying were given at an interval of 15 days. Standard agronomical practices were followed as per recommendations. Observations on disease incidence were recorded after 15 days of last spraying.

Experiment details
Design: RBD
Replication: 3
Spacing: 50 X 10 cm
Fertilizers (N:P:K): 60: 40: 20
Plot size: 4 x 2m
Treatment: 10

Result and Discussion
The nine treatments viz., *Allium sativum, Lantana camera*, Neem seed kernel extract, Iprobenphos, Tricyclazole, Azoxystrobin, Propiconazole, Trifloxystrobin + Tebuconzole and cow urine significantly reduced the blast of pearl millet. The Trifloxystrobin + Tebuconazole @ 0.05% was found most effective as it sure minimum PDI**(**18.3%**)** followed by Propiconazole @ 0.05% (20.0%), Tricyclazole (Beam) @0.1% (22.5%), Azoxystrobin 25 EC @0.05% (25.8%), Iprobenphos (kitazin) 48 EC @0.1% (25.15%), cow urine (28.5%), NSKE (30.95%), *Allium sativum* (35.15%), at last *Lantanca camera* (38.55%) were as the maximum Blast score (0-9)was recorded in control 45.55%. Trifloxystrobin+Tebuconazole was significantly superior over Lantana camera and Tricyclazole but was at par with Propiconazole@ 0.05%, and Azoxystrobin 25 EC @ 0.05%. The maximum grain was obtained in Tricyclazole (27043 kg/ha), followed Triofloxystrobin+Tebuconazole (2593.50 kg/ha), Propiconazole (2515 kg/ha), Azoxtstrobin (2437.25 kg/ha), Iprobenphos (kitazin) (2421.75 kg/ha), NSKE (2312.50kg/ha), *Allium sativum* (2281 kg/ha), control (2046.75 kg/ha), while minimum grain yield was recorded in *Lantana camera* (1999.75 kg/ha) followed by Cow urine (2031.00 kg/ha). The maximum fodder was obtained in Propiconazole (8093.75 q/ha), followed Triofloxystrobin+Tebuconazole (7646.5 q/ha), Tricyclazole (7625.75 q/ha), Azoxtstrobin (7281.5 q/ha), Iprobenphos (kitazin) (6991 q/ha), NSKE (6728.25 q/ha), *Allium sativum* (6594 q/ha), cow urine (6531.25 q/ha), while minimum grain yield was recorded in control (5756.5 q/ha) followed by *Lantana camera* (5847.25 q/ha).

Gouramanis (2007) reported the fungicide Derosal (Carbendazim) @ 1.5 lb/100 gallons and Beam (Tricyclazole) @ 0.75 kg/ha effectively decreased rice neck blast followed by Fongoren (Pyroquilon) @ 2 kg/ha while, Kitazin (Iprobenfos) @ 750 g/ha and bla-s (Blasticidin) @ 100 µg/ml reduced leaf blast but not neck blast infection. Hinosan (Edifenphos) @ 3 lb/100 gallons had moderate effectiveness. Sireesha and Venkateswarlu (2013) [7] conducted a field trial under irrigated conditions for controlling of *Pyricularia grisea* in Rice. The treatments were Neem seed kernel extract, Neem cake, Neem oil, Panchagavya, *Pseudomonas fluorescens*, *Trichoderma viride* and *Pongamia pinna*ta. All the treatments showed significant control of the pathogen. *P. flourescens* was found to be most effective in controlling the leaf blast and neck blast incidence and increased grain yield with number of filled grains.

Sireesha (2013) [6] sprayed neem seed kernel extract, Neem cake, Neem oil, Panchagavya, *Pseudomonas fluorescens, Trichoderma viride* and *Pongamia pinnata.* All the treatments showed considerable control over the pathogen. *P. fluorescens* was found to be most effective in controlling the leaf blast and neck blast incidence and increased grain yield and number of filled grains.

Hubert *et al*. (2015) [4] observed the efficacy of aqueous extracts of *Aloe vera*, *Allium sativum*, *Annonamuricata*, *Azadirachta indica*, *Bidenspilosa*, *Camellia sinensis*, *Chrysanthemum coccineum*, processed *Coffee arabica*, *Datura stramonium*, *Nicotiana tabacum* and *Zingiber officinalis* for control of rice blast disease (*Pyricularia grisea*) *in-vitro* and *in-vivo*. Its showed that processed *C. Arabica* at 10 and 25 % (v/v) had the highest (81.12%) and (89.40%) inhibitory effect, respectively, against *P. grisea*. Aqueous extract from *N. tabacum* at 10 % concentration ranked third (80.35%) in inhibiting *P. grisea*. These were followed by extracts from 25% *A. vera* (79.45%) and 25% *C. coccineum* flower (78.83%). Pal *et al*. (2015) [5] Botanicals and organic product tested at 1% in which, the highest percent inhibition was observed in case of poultry manure (54.13%) followed by neem leaf extract (34.20%). At 5% concentration highest inhibition (67.30%) also were found by poultry manure extract and cow urine which inhibit 51.15% fungal growth. At 10% concentration, the extract of poultry manure was given most significantly affected of pathogen growth 83.20% followed by cow urine (59.33%). In all used three concentration (1%, 5%, and 10%).

Table 1: Management of pearl millet blast through foliar application of chemicals, botanicals and animal waste

Treatment	Mean Blast (PDI %)	Yield	
		Grain kg/ha	Fodder q/ha
Cow urine	28.5	2031.0	6531.25
Iprobenphos	25.15	2421.75	6991.0
Tricyclazole	22.5	2703.00	7625.75
Azoxystrobin	25.8	2437.25	7281.5
Propiconazole	20.0	2515.00	8093.75
Trifloxystrobin + Tebuconazole	18.3	2593.50	7646.5
Allium sativum	35.15	2281.00	6594.0
Lantana camera	38.55	1999.75	5847.25
NSKE	30.95	2312.50	6728.25
Control	45.55	2046.75	5756.5
CD (@5%)	5.299	459.116	1009.842
SEm	1.633	157.381	346.166

Data are the mean of three replications

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