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RESEARCH ARTICLE

SENSITIVITY OF PHYLLOSTICTA ZINGIBERI AGAINST CARBENDAZIM CAUSING LEAF SPOT OF GINGER.

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Abstract

It was found that there was variation in the MIC of carbendazim among the 13 isolates *of Phyllosticta zingiberi* Ramkr. collected from different districts of Maharashtra (Kolhapur, Sangli, Satara), on both *in vitro* and *in vivo*. MIC on agar plates ranged from 2 to 9 % and it was 2 to 8 % on zingiber leaves. Isolate Pz 1 was sensitive to carbendazim and it showed 2 % MIC both *in vitro* and *in vivo* while isolate Pz 11 was resistant to carbendazim and showed 9 % MIC on agar plates and 8 % on zingiber leaves.

Introduction:-

Ginger (*Zingiber officinale* Roscoe.) belongs to family Zingiberaceae, its rhizome is widely used as a spice or a medicine. Ginger is indigenous to south China, and was spread eventually to the spice Islands, other parts of Asia (including India) and subsequently to West Africa and the Caribbean. India is now the largest producer of ginger. In India it is cultivated in Maharashtra, Krnataka, Orissa, Assam, Meghalaya, Arunachal Pradesh, Gujarat, etc. Ginger suffers from many diseases and cause substantial yield loss to ginger production. Leaf spot, caused by *Phyllosticta zingiberi* Ramkr., is one of the most threatening foliar disease and was reported for the first time in India by Ramakrishnan (1941). Symptoms are observed on leaves as oval to elongated spots that later turn whitish spots surrounded by dark brown margin with yellowish hallo (Ramakrishnan, 1941).The present investigation is carried out to determine the minimum inhibitory concentration of carbendazim for effective disease management.

Material and Method:-

13 samples exhibiting leaf spot of ginger were collected from different districts of Maharashtra viz. Kolhapur (Mudal Titta, Majnal, Kolhapur, Mhalunge, Mangnur), Sangli (Jambhali, Zelam, Islampur, Vadiye Raybag, Tandulwadi) and Satara (Dahiwadi, Koregaon, Jaitapur).To isolate the causal agent, the collected samples were brought to the laboratory in sterilized bags. The infected portion of leaf is cut in to the size 2 mm and sterilized by using 0.1% $HgCl_2$ and washed with sterilized distilled water (Jadhav et al., 2010), these sterilized leaf portion were kept on a czapek dox agar plates amended with streptomycin sulphate (Patil et al., 2012; Mali et al., 2015). Inoculated plates were incubated at 28 ± 2^0 C for growth of the fungus and further studies (Mali et al., 2016). After 9-10 days of culture, grayish fungal mass was observed. On the basis of morphological, microscopic characters and following relevant mycological literature the fungal isolate was identified as *Phyllosticta zingiberi* Ramkr. In this manner, 13 isolates were obtained.

The *in vitro* sensitivity of *Phyllosticta zingiberi* was carried out by using Food Poisoning Technique (Dekker and Gielink, 1979). Czapek Dox agar medium plates were prepared containing different concentrations of carbendazim.. After solidification of media, a disc (8 mm) with fungal culture was obtained from the margin of an actively

growing colony and placed upside down on the agar surface. These plates were then incubated at 28-30°C in 12 hour cycle of dark and light and then continuous growth was measured after various time intervals. Plates without carbendazim was served as control.

For *in vivo* experiments Mycelial suspensions of all fungal isolate were prepared in sterile distilled water, and then inoculated on the healthy leaves of *Zingiber officinale* treated with 10 ml solution of different concentrations of carbendazim 24 hours before the inoculation. The experiment was carried out in triplicates. The plants without fungicide treatment served as control. The plants without any treatment served as absolute control.

Table 1:- MIC (Minimum Inhibitory Concentration) of carbendazim against *Phyllosticta zingiberi* isolates causing Leaf spot of *Zingiber officinale.*

Locality	Isolate	***in vitro*** (%)	***in vivo*** (%)
Mudal titta	Pz 1	2	2
Majnal	Pz 2	4	4
Kolhapur	Pz 3	5	4
Mangnur	Pz 4	3	2
Mhalunge	Pz 5	6	5
Jambhli	Pz 6	6	4
Zelam	Pz 7	3	3
Islampur	Pz 8	5	3
Dahivadi	Pz 9	7	5
Koregaon	Pz 10	4	3
Jaitapur	Pz 11	9	8
Vadiye Raybag	Pz 12	7	6
Tandulwadi	Pz 13	8	6

Result and Discussion:-

There was variation in the minimum inhibitory concentration of carbendazim. MIC on agar plates ranged from 2 to 9 % and it was 2 to 8 % on zingiber leaves. Isolate Pz 1 was sensitive to carbendazim and it showed 2 % MIC both *in vitro* and *in vivo* While isolate Pz 11 was resistant to carbendazim and showed 9 % MIC on agar plates and 8 % on zingiber leaves. The results are in agreement with other workers also. Mane (2009) reported MIC of carbendazim against *Alternaria tenussima* causing leaf spot of Taro which is ranged from 4 to 8.5 % *in vitro* and 100 to 20,000 µg/ml *in vivo.* Similarly, Bhale (2009) reported the MIC of carbendazim against *Alternaria alternata* causing leaf spot of spinach was ranging from 350 to 700 µg/ml. Similarly Sutar (2010) found that MIC of carbendazim against *Alternaria alternata* causing leaf spot of gerbera was ranging from 10-15 % both *in vitro* and *in vivo.* According to Khandare (2013) the MIC of carbendazim among 12 isolates of *Alternaria alternata* causing root rot of fenugreek was ranging from 2500 to 5000 µg/ml *in vitro* and 500 to 1000 µg/ml *in vivo.*

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