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RESEARCH ARTICLE

EFFECT OF BENOMYL SPRAY PROGRAM ON DEVELOPMENT OF BENOMYL RESISTANCE IN *FUSARIUM OXYSPORUM F. CONGLUTINANS* CAUSING YELLOWS OF KOHLRABI.

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Abstract

Sensitive isolate *Fusarium oxysporum f. conglutinans* cultured on benomyl continuously for eight successive passages and significantly increased the benomyl resistantance. Use of benomyl alternately with Roko, Kavach and Carbendazim completely inhibited growth of pathogen at 3rd passage only. When benomy mixed with Roko, Kavach, Ridomil, Carbendazim growth of pathogen was completely inhibited at 2nd passage only.

Introduction:-

Kolhrabi (Brassica oleracea var.gongylodes L.) is an important vegetable. It is a stout, round, tuberous and enlarge portion of stem .The whole plant are edible. Kohlrabi has a good amount of fat and zero cholesterol. Such important plant suffers from yellows of kohlrabi caused by *Fusarium oxysporum f. conglutinans.* Many workers has been reported resistance to systematic fungicides in certain fungi (Gangawane and Saler, 1981; More, 2009; Whaghmare, 2010). In the present investigation the effect of different passage on the development of benomyl resistance in *Fusarium oxysporum f.conglutinans* causing yellows of kohlrabi was studied continuously, alternatively and mixed passage with Roko, Kavach, Ridomil and carbendazim up to eight successive passages.

Material and method:-

Fourteen isolates of Kohlrabi yellows were collected from different localities of Maharashtra and Karnataka. The samples of pathogen were isolated on CDA medium and pure culture maintained at 28±2°c for further study. Then MIC of benomyl against the pathogen was determined. After determination of MIC of benomyl, the effect of continuous, alternate treatment of fungicides with two different fungicides having different mode of action in mixture of both on the development of benomyl resistance in sensitive isolate of *Fusarium oxysporum f.conglutinans* (FOC-3) was studied in *in vitro.*

***In vitro* studies:-**

Continuous passage:-

To study the effect of continuous passage, sensitive isolate (FOC-3) was cultured on plates with benomyl (10µg/ml) in triplicate. 8mm diameter agar disc from the previous passage of the same isolate was placed at the center of each plate of next passage. In each passage, linear growth was measured after 6 days. This was repeated up to 8 passages.

Alternate passage:-

To study the effect of alternate passage, sensitive isolate (FOC-3) was cultured on plates containing benomyl with another fungicide, both having equal concentration (10µg/ml) and 8 mm diameter agar disc of fungal culture from the previous passage was transferred to the plate containing same proportion and same concentration.

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Mixed passage:-

To study the effect of mixed passage on benomyl resistance the wild sensitive isolate (FOC-3) was cultured on plates with benomyl with another fungicide both having equal proportion and concentration (10µg/ml). An 8 mm diameter agar disc of fungal culture from the previous passage was transferred on plate with same concentration.

Result and Disscution:-

Culturing of the sensitive *Fusarium oxysporum f. conglutinans* isolate (FOC-3) on continuously increased benomyl resistance. Use of benomyl alternately with Roko, Kavach and Carbendazim completely inhibited the growth of pathogen at third passage only. When benomyl was mixed with Roko, Kavach, Ridomyl and Carbendazim, the growth of pathogen was completely inhibited at second passage only. Horsten, (1979) found that alternate use of ediphenphols with carbendazim controlled the growth of *Septoria nodurum* and *Cercosporella herpotrichadis.* Alternate use of mancozeb with metaxyl also prevented potato plants from *Phytophthora infestans* inciting late blight of potato (Hartill, 1983). According to Gangawane and Shaikh (1988), treatments of aluminum ethylphosphite in mixture with ziram, copper oxychloride and mancozeb increased resistance in *Pythium aphanidermatum* in successive passages. But alternate treatment of these fungicides significantly reduced aluminum phosphite resistance in pathogen from passage to passage.

Table 1:- Effect of exposure of *Fusarium oxysporum f.conglutinans (in vitro)* benomyl continuously and alternating with other fungicide on the development of resistance during 8 passages.

Fungicide	Passage numbers							
	1	2	3	4	5	6	7	8
Benomyl individual	11.50	13.50	15.00	16.00	17.00	17.60	18.00	20.00
Benomyl alt.kavach	9.50	13.50	00	00	00	00	00	00
Benomyl alt.Roko	13.50	10.00	00	00	00	00	00	00
Benomyl alt.Ridomil	10.50	32.50	25.00	11.50	00	00	00	00
Benomyl alt.Carbendazim	11.5	12.5	00	00	00	00	00	00

Mixed Passage:-

Table 2:- Effect of exposure of *Fusarium oxysporum f.conglutinans (in vitro)* benomyl with other fungicide on the development of resistance during 8 passages.

Fungicide	Passage number							
	1	2	3	4	5	6	7	8
Benomyl + Roko	31.00	00	00	00	00	00	00	00
Benomyl+Kavach	43.00	00	00	00	00	00	00	00
Benomyl+Ridomil	46.00	00	00	00	00	00	00	00
Benomyl+Carbendazim	50.00	00	00	00	00	00	00	00

Referances:-

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