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SYNERGISTIC EFFECT OF AGROCHEMICALS ON DEVELOPMENT OF STREPTOCYCLINE RESISTANCE IN XANTHOMONAS AXONOPODIS

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ABSTRACT:-

Maharashtra is the leading producer of Pomegranate in the country and accounts for 66.2% of the total production of pomegranate in the country.Pomegranate plant having various economic important but it get infected due to the various fungal and bacterial diseases. Large scale infestation of Bacterial Blight disease caused due to Xanthomonas axonopodis pv. Punicae has resulted in considerable damage to the crop from 2006-07. The studies on the effect of streptocycline with different agrochemicals will help in the management of the disease.

KEY WORDS: *Pomegranate, Bacterial Blight, Xanthomonas axonopodis*

1. INTRODUCTION:

Pomegranate (*Punica granatum* L.) belongs to the family punicaceae. It is an ancient fruit crop of India. The fruits of pomegranate are known to possess pharmaceutical and therapeutic properties with high medicinal value. Among the diseases infecting pomegranate, the bacterial disease popularly known as 'Bacterial Blight' caused by '*Xanthomonas axonopodis* pv. *punicae'.* Pomegranate (*Punica granatum* L.) belongs to the family punicaceae. It is an ancient fruit crop of India. It is regarded as "vital cash crop" of an Indian farmer and is grown in an area of 1.3 lakh ha. with a production of 11.0 lakh tones (Jadhav and Sharma, 2009). Pomegranate the boon commercial fruit crop to the farmer turned as a big bane after the severe outbreak of Bacterial Blight. Many growers finding no options to mitigate the disease effectively have uprooted their crop owing to unbearable losses. Any one chemical can produce the resistance of that chemical in the bacterium So, study of synergistic effect of various agrochemicals in management of the disease is helpful to increase the yield of pomegranate.

2. MATERIAL & METHOD

Effect of various agrochemicals on the development of resistance in *Xanthomonas axonopodis* was studied by mixing different Fungicides (Kocide-101, Roko, Dhunuka and Bavistin); Insecticides (Dunet, Krinet, Dantotsu and Sharp); Herbicides (Sencor, Krizin, Mera71 and VIGOR71). These agrochemicals were used in combination with streptocycline (5500µg/ml) in order to find out their synergistic effect. The resistant isolate Xap-11 was selected for this study. It was grown on the nutrient glucose broth medium containing,

resistant dose of streptocycline 5500 µg/ml with agrochemicals at different concentrations. Increase in the growth of pathogen over streptocycline control was considered to the increase in the resistance while decrease was considered to be decrease in the resistance. Growth on streptocycline alone served as control.

In vivo studies resistant Xap-11 isolate was inoculated on pomegranate fruits treating them with streptocycline. In this method, pomegranate fruits were treated with mixture of streptocycline 4200 µg/ml and agrochemicals for 24 hrs and then inoculated with bacterial suspension. Pomegranate fruits treated with streptocycline 4200 µg/ml alone served as control. Inoculated pomegranate fruits were wrapped in sterilized paper and the diameter of infected portion was measured at every day upto four days of incubation periods and it was compared with control.

3. RESULT &DISCUSSION

***In vitro* studies**

Agrochemicals such as Fungicides, Insecticides, Herbicides were mixed with Streptocycline in the nutrient glucose broth medium. Streptocycline resistant Xap-11 isolate was inoculated in the test tubes and growth was measured after 24 hours. Increased growth over Streptocycline alone 'control' was considered as increase in the resistance or *vice-versa.*

Fungicides

Kocide-101, Roko, Dhunuka and Bavistin were used for this study. These fungicides were mixed with Streptocycline (5500µg/ml) at various concentrations (25, 50, 75 and 100 µg /ml). Among the fungicides Kocide-101 and Dhunuka at 25 µg/ml with Streptocycline (5500 µg/ml) completely checked the growth of the pathogen. Roko and Bavistin at 75 µg /ml along with Streptocycline showed inhibitory action on the pathogen (Table. 01)

Insecticides

Dunet, Krinet, Dantotsu and Sharp were used for this study. These insecticides were mixed with Streptocycline (5500 µg/ml) at various concentrations (25, 50, 75 and 100 µg /ml). Among the insecticides Dunet, Dantotsu and Sharp at 50 µg/ml with Streptocycline (5500 µg/ml) completely checked the growth of the pathogen. Krinet at 75 µg /ml along with Streptocycline showed inhibitory action on the pathogen. (Table.03)

Herbicides

Among the herbicides, Sencor, Krizin and VIGOR-71 at 50 µg/ml with Streptocycline (5500 µg/ml) completely checked the growth of the pathogen. Mera71 at 75 µg /ml along with Streptocycline showed inhibitory action on the pathogen (Table.05)

4. *IN VIVO* STUDIES

In vivo studies were carried out on pomegranate fruits. A 6 mm diameter and 15 mm deep well was filled with Streptocycline (4200µg/ml) in combination with other agrochemicals 24 hrs earlier and bacterial suspension of resistant isolate (Xap-11) was inoculated in the well. The well was closed with disc. The diameter of infection was measured at after three days of incubation period and calculated as (%) of control. Increased infection over Streptocycline alone control was considered as increase in the resistance and *vice-versa.*

Fungicides

Kocide-101, Roko, Dhunuka and Bavistin were mixed with streptocycline (4200µg/ml) at various concentrations (25, 50, 75 and 100 µg/ml). Among the fungicides Kocide-101 and Dhunuka at 25 µg/ml with Streptocycline (5500 µg/ml) completely checked the growth of the pathogen. Roko and Bavistin at 75 µg /ml along with streptocycline showed inhibitory action on the pathogen (Table 02)

Insecticides

Dunet, Krinet, Dantotsu and Sharp were used for this study. These insecticides were mixed with streptocycline (5500 µg/ml) at various concentrations (25, 50, 75 and 100 µg /ml). Among the insecticides

Dantotsu and Sharp at 25 µg/ml with Streptocycline (5500 µg/ml) completely checked the growth of the pathogen. Krinet at 50 µg /ml while Dunet at 75 µg /ml along with streptocycline showed inhibitory action on the pathogen (Table 04)

Herbicides

Among the herbicides, Sencor, Krizin and VIGOR-71 at 50 µg/ml with Streptocycline (4200 µg/ml) completely checked the growth of the pathogen. Mera 71 at 75 µg /ml along with streptocycline showed inhibitory action on the pathogen (Table 06)

Table 01: Synergistic effect of fungicides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae* (*In vitro*).

Sr. No.	Fungicides with streptocycline (5500 µg/ml)	*In vitro* growth (turbidity at 660 nm)
1	**Kocide-101**	
	25	0.000
	50	0.000
	75	0.000
	100	0.000
2	**Roko**	
	25	0.009
	50	0.001
	75	0.000
	100	0.000
3	**Dhunuka**	
	25	0.000
	50	0.000
	75	0.000
	100	0.000
4	**Bavistin**	
	25	0.010
	50	0.004
	75	0.000
	100	0.000
5	**Control**	0.012

Table 02: Synergistic effect of fungicides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae* (*In vivo*).

Sr. No.	Fungicides with streptocycline (4200 µg/ml)	*In vivo* growth (% of infection)
1	**Kocide-101**	
	25	00.00
	50	00.00
	75	00.00
	100	00.00
2	**Roko**	

	25 50 75 100	15.00 07.00 00.00 00.00
3	**Dhunuka** 25 50 75 100	 00.00 00.00 00.00 00.00
4	**Bavistin** 25 50 75 100	 12.00 07.00 00.00 00.00
5	**Control**	08.00

Table 03: Synergistic effect of insecticides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae* (*In vitro*).

Sr. No.	**Insecticides with streptocycline (5500 µg/ml)**	***In vitro* growth (turbidity at 660 nm)**
1	**Dunet** 25 50 75 100	 0.013 0.000 0.000 0.000
2	**Krinet** 25 50 75 100	 0.014 0.010 0.000 0.000
3	**Dantotsu** 25 50 75 100	 0.007 0.000 0.000 0.000
4	**Sharp** 25 50 75 100	 0.013 0.000 0.000 0.000
5	**Control**	0.012

Table 04: Synergistic effect of insecticides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae* (*In vivo*).

Sr. No.	Insecticides with streptocycline (4200 µg/ml)	*In vivo* growth (% of infection)
1	**Dunet**	
	25	10.00
	50	07.00
	75	00.00
	100	00.00
2	**Krinet**	
	25	13.00
	50	00.00
	75	00.00
	100	00.00
3	**Dantotsu**	
	25	00.00
	50	00.00
	75	00.00
	100	00.00
4	**Sharp**	
	25	00.00
	50	00.00
	75	00.00
	100	00.00
5	**Control**	08.00

Table 05: Synergistic effect of herbicides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae* (*In vitro*).

Sr. No.	Herbicides with streptocycline (5500 µg/ml)	*In vitro* growth (turbidity at 660 nm)
1	**Sencor**	
	25	0.010
	50	0.000
	75	0.000
	100	0.000
2	**Krizin**	
	25	0.008
	50	0.000
	75	0.000
	100	0.000
3	**Mera 71**	
	25	0.009
	50	0.001
	75	0.000

	100	0.000
4	**VIGOR 71**	
	25	0.009
	50	0.000
	75	0.000
	100	0.000
5	**Control**	0.012

Table 06: Synergistic effect of herbicides on the development of streptocycline resistant in *Xanthomonas axonopodis* pv. *punicae (In vivo*).

Sr.No.	**Herbicides with streptocycline (4200 µg/ml)**	***In vivo* growth (% of infection)**
1	**Sencor**	
	25	08.00
	50	00.00
	75	00.00
	100	00.00
2	**Krizin**	
	25	08.00
	50	00.00
	75	00.00
	100	00.00
3	**Mera 71**	
	25	12.00
	50	07.00
	75	00.00
	100	00.00
4	**VIGOR 71**	
	25	07.00
	50	00.00
	75	00.00
	100	00.00
5	**Control**	08.00

Kishun and Sohi (1984) reported that bacterial canker of mango could be effectively controlled by four sprays of Bavistin (0.1%) or Bavistin (0.1%) + Agrimycin-100 (100 ppm). Suriachandraselvan *et al.,* (1993) suggested the application of Paushamycin (0.05%) in combination with copper oxychloride (0.2%) for the control of bacterial disease on pomegranate caused by *Xanthomonas axonopodis* pv. *punicae*.

According to Manjula *et al.,* (2002) as they achieved the effective control of bacterial blight of pomegranate with the sprays of Streptocycline or K-cycline or bacterinol-100. The technical grade of bactrinol-100 is same as that of bronip/bactrinashak/bactinash-200 i.e., 2 bromo-2 nitro propane, 1, 3, diol. Results pooled over the seasons revealed the significantly superior efficacy of bronip (0.05%) + COC (0.2%) than all the treatments in reducing the disease incidence. The next best effective treatments were

bactinash-200 + COC, bactrinashak + COC, K cycline + COC and Streptocycline + COC which recorded disease incidence ranged between 23.26 to 30.89 per cent.

Pruning of infected parts along with spray of copper oxychloride followed by four sprays of Streptocycline (100 ppm) + copper oxychloride (0.3%) was suggested by Gopal *et al.,* (2004) for the effective control of bacterial canker of acid lime. Yenjerappa *et al.,* (2004) reported the superior efficacy of Streptocycline (0.05%) in combination with copper oxychloride (0.2%) in mitigating the bacterial blight menace on pomegranate. The efficacy of streptocycline in combination with copper oxychloride was very much emphasized against bacterial blight control.

The results are similar with the reports of Ravikumar and Yenjerappa (2005), who achieved the effective control of bacterial blight of pomegranate with five sprays of bactrinashak (0.05%) in combination with copper oxychloride (0.2%) along with highest yield and maximum benefit: cost ratio. However, the efficacy of bactinashak stands next to bronip or bactinash-200 in controlling the bacterial blight of pomegranate in the present study.

6. REFERENCES

Kishun, R. and Sohi, H. S. (1984). Control of bacterial canker of mango by chemicals. *Pesticides*, 18: 32-33.

Suriachandraselvan, M., Jayasekar, M. and Anbu, S. (1993). Chemical control of bacterial leaf spot and fruit spot of pomegranate. *South Indian Horti.,* 41 (4): 228-229.

Manjula, C. P., Khan, A. N. A. and Ravikumar, M. R. (2002). Management of bacterial blight of pomegranate (*Punica granatum* L.) caused by *Xanthomonas axonopodis* pv. *punicae*. Paper presented In : *Ann. Meet. Symp. Plant Disease Scenario in Southern India,* held at Bangalore (India), December 19-21, p. 52.

Yenjerappa, S. T., Ravikumar, M. R., Jawadagi, R. S. and Nazir Ahmed Khan (2004).*In vitro* and *in vivo* efficacy of bactericides against bacterial blight of pomegranate. Paper presented In: *Nat. Symp. Crop Surveillance: Disease Forecasting and Management*, IARI, New Delhi (India), February 19-21, p. 84.

Gopal, K., Reddy, M. R. S. and Prasad Babu, G., (2004). Management of bacterial canker in acid lime (*Citrus aurantifolia* Swingle) in Andhra Pradesh. *Indian J. Pl. Prot.*, 32 (1): 111-113.

Ravikumar, M. R. and Yenjerappa, S. T. (2005). Management of bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae* in Karnataka. *Proc. Sem. on Pomegranate*, Maharashtra Pomegranate Growers Association, Pune, p. 130.