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BIOEFFICACY OF *T. HARZIANUM* CULTURE EXTRACT ON CROP PRODUCTIVITY OF WATERMELON

[1]A. N. Tambe and [2]A. M. Bhosale
[1]S.N. Arts, D. J.M. Commerce and B. N. S. Science College, Sangamner, Ahmednagar, (M.S.) INDIA,
[2]Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar(M.S.)
Email- tashok61@yahoo.in

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ABSTRACT:

Significant effect of the microorganism treatment on plant growth has been reported by several workers for many crops including Watermelon. In present investigation *T. harzianum* was cultured in modified glucose medium and extracted by ethyl acetate. HPLC and GCMS analysis of extract confirmed presence of plant growth regulators such as GA3 and IAA. Various conc. of extracted PGRs were prepared and applied on watermelon to analyze bioefficacy. Results indicated that 10% treatment significantly increases number of flowers, whereas increased in concentration above 10% inhibits flowering. Spraying of purified growth regulators significantly increases number of fruit over the control in all treatments, maximum number of fruits were observed in 5% treatment (11.6) followed by 10% and 15% over the control(5.66). Similarly all treatments in watermelon showed improvement in fruit weight significantly. Highest average weight of fruits was recorded in 10% conc. (3.9 Kg), followed by 15% and 5% over the control (2.26), this finding confirmed that *Trichoderma* culture extract significantly promotes crop productivity.

Key Words :- *Trichoderma, bioefficacy, watermelon, PGR.*

INTRODUCTION:

Watermelon (*Citrullus lanatus*) is an important fruit crop and cultivated all over the world. Plant growth regulators are known to improve crop yield many fold in many crops and genes for production of PGRs are distributed all over plant kingdom(Tien et al., 1979; Badenoch-Jones et al., 1982; Comai and Kosuge, 1980; Liu et al., 1982; Atzorn et al., 1988; Fallik, et al., 1989; El-Khawas and Adachi, 1999; Fuentes-Ramírez et al., 1993; Bastián et al., 1998; Manulis et al., 1998; Al-Askar et al., 2016; Ismail et al., 2017).Several workers demonstrated that application of *Trichoderma* show significant improvement in crop productivity in watermelons (Wu et al., 2009; Hamed et al., 2011; Ramesh et al., 2017)

Trichoderma species have long been identified as plant beneficial fungi and known to improve crop yield in many crops including watermelon (Manoranjitham et al. 2000; Rasool 2011; Ozbay et al., 2004; Ramesh 2017; Uddin et al. 2018). Recent reports shown that *Trichoderma* produce PGRs like GA3 and IAA (Windham et al., 1986; Roco and Perez, 2001; Gravel et al., 2007; Contreras-Cornejo et al., 2009; Ismail et al. 2017; Al-Askar et al., 2017). Considering the benefits, *T. harzianum* liquid culture was carried out and bioefficacy of culture extract was tested on watermelon.

MATERIALS AND METHODS:

Isolation, purification and identification:

Indigenous strains of *Trichoderma were* isolated by using serial dilution technique from soil around rhizosphere soil on *Trichoderma* Selective Medium (Johnson and Curl, 1972; Elad and Chet, 1983; Bhagat, 2008, Bhagat and Pan, 2010).

Individual strains were purified by repeated sub culturing and they were identified on the basis of morphological, cultural and molecular characters (Rifai, 1969; Gam and Bisset, 1998; Bhagat and Pan, 2010).

Liquid culture:

Selected strain was cultured in modified glucose medium (Glucose 30g/l, Ammonium tartrate 10g/l, Potassium phosphate 3.0g/l and potassium sulphate 0.2g/l) at optimum physical condition 30^0 C Temp, 216 hrs. Incubation period and 100 rpm.

Extraction and chemical analysis:

Culture filtrate was extracted by ethyl acetate and chemical analysis was carried out by using advanced analytical instrument such as UV spectrophotometer, HPLC and GCMS (Mahadevan and Chandramohan, 1966; Mahadevan and Sridhar 1982; Rachev et al., 1993 and Kirti et al. 2009).

Crop treatment and bioefficacy:

To analyze crop productivity two sprays of extracted PGRs were applied with five days interval at onset of flowering (5, 10 and 15 %). Number of flowers was counted on 15th day of treatment whereas fruit weight was measured at maturity.

RESULT AND DISCUSSION:

Native strain of *T. harzianum* was successfully isolated on TSM (Elad and Chet, 1983) and was maintained on PDA (Ricker and Ricker, 1936). Purified strain was identified on the basis of morphological, cultural and molecular characteristics. Culturing of purified strain was carried out in modified glucose medium and culture filtrate was extracted successfully by using by ethyl acetate. Chemical analysis was carried out by using analytical techniques such as UV spectrophotometer, HPLC and GCMS and found that extract contains plant growth regulators like GA3 and IAA. These resultsin accordance with many workers who reported that *T. harzianum* produce PGRs (Windham et al., 1986; Roco and Perez, 2001; Gravel et al., 2007; Contreras-Cornejo et al., 2009; Ismail et al. 2017; Al-Askar et al., 2017). To study effect of T. harzianum PGRs on productivity of watermelon local cultivar was selected. Spraying of extracted PGRs was undertaken at onset of flowering, with five days interval two sprays of extracted PGRs were applied. Crop productivity was analyzed by yield parameters such as number of flowers, number of fruits, and weight of fruits. Results tabulated in table 1 indicate that 10% treatment significantly increases number of flowers, whereas increased in concentration above 10% inhibits flowering. Maximum number of flowers was observed in 10% conc. (48) over the control (37.66) and least number in 15% (32.66). Spraying of purified growth regulators significantly increases fruit over the control in all treatments, maximum no of fruits were observed in 5% treatment (11.6) followed by 10% and 15% over the control (5.66). Similarly all treatments in watermelon showed improvement in fruit weight significantly. Highest average weight of fruits was recorded in 10% conc. (3.9 Kg), followed by 15% and 5% over the control (2.26), this finding confirmed that *Trichoderma* culture extract significantly promotes crop productivity. These results were in accordance with Chet (2001). Studies on effect of plant growth promoting abilities of *Trichoderma* in melons indicates that application of *Trichoderma* improve seed germination and seedling growth (Hamed et al., 2011). Considering the benefits liquid culture of selected strain of *Trichoderma* and foliar application should be applied at optimum concentration to obtain maximum yield.

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Table 1: Effect of *Trichoderma* PGRson Watermelon

Sr. No.	Parameter	*Trichoderma* PGRs concentration			
		Control	5%	10%	15%
1	Number of flowers	37.6±2.05	46.6±1.24	48.5±1.63**	32.6± 5.24
2	Number of fruits	5.6±1.69	11.6±1.24**	8.6±1.24	7.0±1.41
3	Fruit weight at maturity (kg)	2.2±0.16	2.4±0.44	3.9±0.21**	2.6±0.16

± S.D. , Significant over control (* t ≥ t critical at 5% , ** t ≥ t critical at 1%)

Figure 1: Effect of PGRs on Watermelon productivity

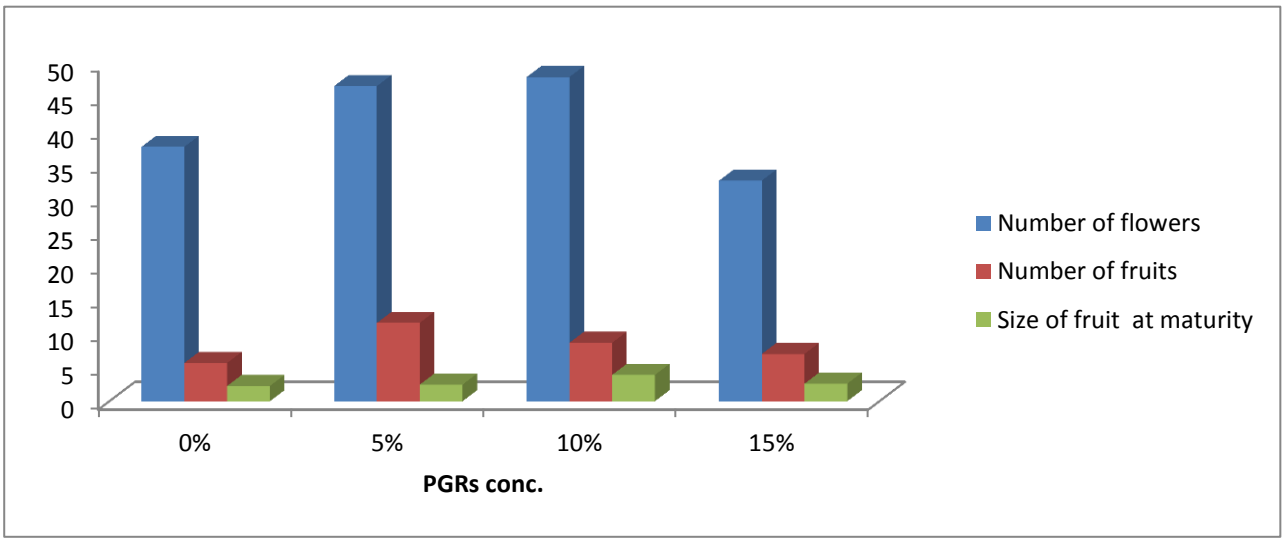

Plate 1: Effect of *Trichoderma* PGRs conc. on Watermelon productivity

Control

5%

10%

15%

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