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Canlı Ekmek Mayasının Taze Fasulyede Meloidogyne incognita Zararını Kontrol ve Verim ile Kalite Üzerine Etkisi

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Özet

Araştırmada, biyolojik yönden aktif içeriği olan, sukroz, siyah bal ve molassesses ilave edilmiş Saccharomyces cerevisiae mantarı ile tarla şartlarında çalışılmıştır. Fermentasyon sonrası, maya kültürü % 0.25, 0.50 ve 1 konsantrasyonlarda kullanılarak, fasulye altvaryetesi olan Paulista'da kök nematoduna yol açan Meloidogyne incognita (Kofoid & White) Chitwood'nın biyokontrolündeki etkisine bakılmıştır. Tüm uygulamaların istatistiki olarak önemli seviyede (P≤0.01 and 0.05) köklerdeki M. incognita galeri sayısında ve yumurta miktarında azalmaya yol açtığı belirlenmiştir. Galeri ve yumurta yoğunluğundaki % cinsinden azalma ile uygulanan konsantrasyonlar arasında negatif korelasyon olduğu tespit edilmiştir. Uygulamadan 1 ay sonra, sukroz ile aktive edilen maya kültürlerinde, en yüksek maya konsantrasyonu; galerilerde en fazla azalmaya yol açmıştır (66.7%) ve bunu sırasıyla normal ve düşük dozlar takip etmiştir (% 55.6 ve 44.4). Bunun yanı sıra, siyah bal ile aktive edilen mayalarda, galeri sayısında konsantrasyonlara bağlı olarak sırasıyla %77.8, 66.7 ve 33.3 oranlarında azalma meydana gelmiştir. Molasses ile aktive edilenlerde ise en yüksek azalma %77.8 ile en yüksek konsantrasyonda iken, bunu sırasıyla diğer iki konsantrasyon takip etmiştir (%66.7). Üç ay sonra (hasatta), aynı uygulamalar; nematod parametrelerinde yine aynı eğilimi göstermiştir. Benzer olarak, farklı materyaller ile aktive edilen mayalar, bakla üretim kantitesini (adet ve ağırlık yönünden) ve kalitesini (protein ve karbonhidratlar) artırırken, test konsantrasyonları ile pozitif korelasyon olduğu ortaya çıkmıştır. Sonuçlara göre, maya konsantrasyonlarının artırılması; nematod kontrolüne ilaveten bitki beslenmesine de olumlu yönde etki etmektedir.

***Anahtar Kelimeler:** aktivatörler, ekmek mayası, Meloidogyne incognita, taze fasulye.*

Effect of Biologically Active Bread Yeast on Controlling Meloidogyne incognita Infesting Green Bean and on The Yield Quantity and Quality

Abstract

A biologically active compound, bread yeast containing the fungus Saccharomyces cerevisiae activated by adding sucrose, black honey and molasses was studied under field conditions. After fermentation, yeast was used at concentrations of 0.25, 0.50 and 1% for biocontrolling of Meloidogyne incognita (Kofoid & White) Chitwood root-knot nematode infesting common bean cv. Paulista. All treatments significantly (P≤0.01 and 0.05) decreased M. incognita as indicated by the number of galls and egg-masses on roots. There is a negative correlation between the percentage reduction of the number of galls and egg-masses and different concentration used. One month after application, the highest concentration of yeast caused the highest percentage reduction of galls (66.7%) followed by the moderate and the lowest concentrations (55.6 and 44.4%, respectively) for yeast activated by sucrose. Whereas, yeast activated by black honey at the respective concentrations caused 77.8, 66.7 and 33.3% reduction in the number of galls. Yeast activated by molasses at the highest concentration caused the highest percentage reduction of galls (77.8%) followed by the other two concentrations (66.7%). After three months (at harvest), the same treatments behaved the same trend in reducing nematode parameters. Also, yeast activated by the different materials increased pod production quality (number and weight of pods) and quantity (proteins and carbohydrates) and positively correlated to the tested concentrations. It is concluded that yeast concentrations increase plant nutrition in addition to nematode management.

***Key Words:** activators, bread yeast, Meloidogyne incognita, green bean.*

Introduction

Plant parasitic nematodes cause global losses to crop plants with an estimated loss of 125 billions $ per year (Chitwood, 2003). Most of these losses are attributed to root-knot nematode (*Meloidogyne* spp) all over the world. Much of the increases in agricultural control through the use of synthetic chemical pesticides. However, there is a continuous and growing social legislative pressure to reduce the toxicological and

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environmental risks associated with control of agricultural pests and pathogens with these chemicals. The research for new microbial isolates to use as sources of biological biocides is an important goal for those seeking to reduce the significant economic damage caused by plant parasitic nematodes. Fungi have shown antagonistic activity towards nematodes, offering an extensive pool of biocontrol agents (Siddiqi & Mahmoud, 1996). Some reports on the effect of bread yeast fungi containing *Saccharomyces cerevisiae* on the nematodes have been reported (Youssef & Soliman, 1997; Ismail *et al*., 2005; Noweer & Hasabo, 2005; Radwan *et al*., 2007). But the effect of certain biological activators to yeast has not yet studied. The present work describes the probability effect of active bread yeast as affected by three biological activators on *M. incognita* infesting green bean under field conditions.

Material and Methods

This experiment was carried out in a clay loam soil infested with *Meloidogyne incognita* root-knot nematode at Gezeyh, Imbaba County, Giza Governorate, Egypt. This field was planted with green bean (*Phaseolus vulgaris*) Cv. Paulista (green bean is cultivated for green pods but common bean is cultivated for dry seeds). Seeds of green bean were sown in rows of 60 m long, hills (spots in which seeds are cultivated) 20 cm apart, at late December in 2006. Bread dry yeast (Commercial product) was activated by adding sucrose, black honey or molasses to a fixed weight of yeast for two hours in 1 L warm water (for easing solubility), and then completed to 20 L water. The activators were obtained from Sugar cane Industry Complementary Company, Cairo, Egypt. There were three different yeast concentrations and three different activators as follows:

T_1 50g bread yeast + 250g sucrose in 20L water (0.25%).

T2 100g bread yeast + 250g sucrose in 20L water (0.50%).

T3 200g bread yeast + 250g sucrose in 20L water (1%).

T4 50g bread yeast + 250g black honey in 20L water (0.25%).

T5 100g bread yeast + 250g black honey in 20L water (0.50%).

T6 200g bread yeast + 250g black honey in 20L water (1%).

T7 50g bread yeast + 250g molasses in 20L water (0.25%).

T8 100g bread yeast + 250g molasses in 20L water (0.50%).

T9 200g bread yeast + 250g molasses in 20L water (1%).

T10 Untreated (adding water to the soil).

Four liters of each solution were soil-drenched in each row (replicate) on 22 January in 2007. There were five replicates (rows) for each treatment distributed in a randomized block design. Five root samples (each is the whole root system) were taken one month (on 22 February), and three months (on 22 March) after yeast application. Number of galls and egg masses were estimated for each root system. Also, number and weight of pods and number of nodules were recorded at the end of the experiment (on 22 March). Total carbohydrates from pods were determined calorimetrically by the method of Smith *et al*., (1956) and protein from pods as described by Lowery *et al*. (1951).

Results and Discussion

Data recorded in Tables 1 and 2 showed the tested concentrations of active bread yeast significantly ($p \leq 0.05$) reduced *M. incognita* criteria as indicated by the percentage reduction of nematode galls and egg masses on roots of green bean cv. Paulista and improved pod production quality and quantity. Also, the bacterial nodules are increased at different yeast concentrations. In other words, one month after yeast application, the highest concentration of yeast caused the highest percentages reduction of galls (66.7%) followed by the moderate and the highest concentrations (55.6 and 44.4%, respectively) for yeast activated by sucrose. Whereas, yeast activated by black honey at different concentrations caused percentages 77.8, 66.7 and 33.3% reductions in the number of galls. Yeast activated by molasses at the highest concentration caused the highest percentage reduction of galls (77.8%) followed by the other two concentrations (66.7%). After three months (at harvest), the same treatments behaved the same trends in reducing nematode parameters, as the highest concentration of activated yeast caused the highest percentage reduction compared to other concentrations (Table 1). On the other hand, numbers of bacterial nodules are significantly increased at the different concentrations activated by sucrose, black honey or molasses. The highest percentage increase (275 %) of nodules occurred by using yeast at the highest concentration activated by molasses than those caused by sucrose (200%) and black honey (150%). As for green bean yield, numbers of pods are positively increased by using the different concentrations of yeast. The most significant percentage increase (233%) occurred at the highest concentration (1%) of bread yeast activated by molasses followed by yeast (1%) activated by black honey (173%) and yeast (1%) activated by sucrose (150%). As for weight of pods, it behaved the same trend as their percentage increases were positively correlated to the tested concentrations of yeast. Regarding the quality of pods, the percentage proteins and carbohydrates are increased especially at the highest concentration of yeast compared to the untreated check.

Table 1. Effect of active dry yeast on galls and eggmasses caused by *Meloidogyne incognita* infesting common bean cv. Paulista.

Treatments	After one month		After three months			
	No. of galls	Reduction (%)	No. of galls	Reduction (%)	No. of egg masses	Reduction (%)
T1	٥5±1.58 b	44.4	13±1.87 bc	85.7	6±1.58 c	82.9
T2	4±1.58 bc	55.6	12±1.52 c	86.8	4±1.22 cd	88.6
T3	3±1.52 cd	66.7	11±1.58 c	87.9	4±1.22 cd	88.6
T4	6±1.58 b	33.3	16±1.52 b	82.4	3±1.0 cd	91.4
T5	3±1.52 cd	66.7	12±1.52 c	86.8	3±1.0 cd	91.4
T6	2±0.71 d	77.8	6±1.48 d	93.4	13±1.58 b	62.9
T7	3±1.52 cd	66.7	12±1.52 c	86.8	4±1.22 cd	88.6
T8	3±1.52 cd	66.7	7±1.58 d	92.3	2±0.71 d	94.3
T9	2±1.58 d	77.8	5±1.58 d	94.5	1±1.0 d	97.1
Untreated (control)	9±1.58 a	-	91±7.39 a	-	35±6.12 a	

Values are means of five replicates.

Reduction (%) = Control - Treated / Control X 100.

SD = Standard deviation.

٥ Means in each column with the same letter(s) are not significantly ($p \leq 0.05$) different according to Duncan Multiple Rang test.

Table 2. Effect of active dry yeast on yield parameters and technological characters as influenced by *Meloidogyne incognita* infesting common bean cv. Paulista

Treatments	No. of nodules	Increase (%)	No. of pods/ plant	Increase (%)	Weight of pods/fed. (Ton)	Increase (%)	Protein (%)	Total Carbohydrates (%)
T1	6±1.58 de	50	68 d	127	6.3 e	125	15.70	36.70
T2	12± 2.5 b	200	75 c	150	7.0 d	150	24.80	39.20
T3	6±1.58 de	50	48 f	60	4.2 h	50	9.20	38.00
T4	8±1.58 cd	100	60 e	100	4.9 g	75	11.20	36.60
T5	10±1.87 bc	150	82 b	173	8.4 b	200	12.90	37.90
T6	6±1.58 de	50	60 e	100	7.7 c	175	14.20	32.70
T7	10±1.87 bc	150	74 c	147	8.8 b	214	14.50	33.10
T8	15±1.41 a	275	100 a	233	10.5 a	275	17.90	34.40
Untreated (control)	4±1.58 e	-	30 g	-	2.8 i	-	13.02	32.50

Values are means of five replicates.

Increase (%) = Treated - Control / Control X 100.

Various positive effects of applying active bread yeast as a biostimulator were attributed to its contents of different nutrients, proteins, large amounts of vitamin B and the natural plant growth hormones namely, cytokinens. In addition, application of active bread yeast would release CO_2 produced from fermentation process (Larson *et al*., 1962; Idso *et al*., 1995; Mostafa, 2004). Also, the different concentrations used, in this study, significantly ($p \leq 0.05$) reduced *M. incognita* criteria and that nematode reduction was positively correlated with the tested concentrations of active bread yeast, as the yeast concentrations are higher, the more effect on nematode population occured. Also, active bread yeast acted as a nutrient material improving plant growth and yield. In addition, the active yeast could also increase pod production of green bean plants quantity and quality. The obtained results agree with those obtained by Noweer & Hasabo (2005) and Radwan *et al*., (2007) who mentioned that the effect of yeast on *M. incognita* might be due to the activity of some isolates of *S. cervisiae* to convert carbohydrates to ethyl alcohol and CO_2 which are toxic to nematodes. The results agree with Ismail *et al*. (2005) who stated that molasses acts as a carrier for certain antagonistic fungi. In conclusion, active bread yeast serves as a nutrient material for plants compared to nematode suppressants.

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