

# THE EFFICIENCY OF THE POWDER, AQUEOUS AND ALCOHOLIC EXTRACTS FOR FENUGREEK FLOWERS (*TRIGONELLA FOENUM*) BIO-FERTILIZED WITH *PSEUDOMONAS FLUORESCENS* BACTERIA AGAINST THE FUNGUS (*PENICILLIUM* SPP.) THAT CAUSING GREEN AND BLUE MOLD ON THE ORANGE

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**ABSTRACT :** This study was conducted in the Laboratory of Disease, Al-Mussaib Technical College for studying the efficiency of the powder, aqueous (hot and cold) and alcoholic extracts for Fenugreek plant (*Trigonella foenum*) bio-fertilized with *Pseudomonas fluorescens* Bacteria against the fungus (*Penicillium* spp.) that causing green mold and blue on the orange. The results showed that the bio-fertilized Fenugreek powder had a significant effect in inhibiting the growth of the two fungi where the percentage amounted of 100% and the averages diameters of colony for both fungi were zero at 3% concentration, Which represented the Minimum Inhibition Concentration (MIC). As for the extracts, the alcoholic extract was more efficient than the hot and cold aqueous extract, where the highest percentage of inhibition amounted of 93.5% for the *P. digitatum* fungi at the concentration of 7.5% compared to the inhibiting percentages for hot and cold aqueous extract where amounted of (85.41%, 78.90%) and for the same concentration, respectively, 100% at concentration, 10% for *P. digitatum* fungus and 80.20% for *P. italicum* fungus and for the same concentration. All the used extracts had the ability to conserve fruit for 30 days at a temperature of  $0 \pm 25^{\circ}\text{C}$ .

**Key words :** Aqueous extract, alcoholic extract, *Trigonella foenium*, *Pseudomonas fluorescens*, *Penicillium* spp., blue and green mold.

## INTRODUCTION

Fenugreek (*Trigonella foenum*) is considered a plant belonging to the fabaceae family. It is an herbaceous plant that is similar to alfalfa. The flowers are small and yellow. They are characterized by a distinctive aroma that is cultivated in India, Pakistan, Central and Southern Europe (Adel *et al*, 1985). In Iraq, the Fenugreek is cultivated in the northern regions of Dohuk and Sulaymaniyah, as well as in the area of Amarah (Bancroft *et al*, 1984). Fenugreek contains high levels of proteins, carbohydrates, fats and vitamins such as thiamine B1, riboflavin B2, Nicotinic acid B5 and folic acid B9, It also contains compounds of alkaloids, most notably trichomellenin, chlorine and phenols such as Coumaric acid. Orange (*Citrus sinensis*) is considered one of the leading citrus cultivars that is in the forefront after grapes in terms of consumption (Eckert and Eaks, 1989). Citrus fruits are exposed to diseases caused by the field fungi and storage fungi and may help in the damage during harvesting, packaging, transport and storage and as a result for that

is infecting it with fungi. The most important fungi are the blue and green mold on orange fruits causing by the *Penicillium digitatum* fungus and *Penicillium italicum* fungus, respectively (Wilson *et al*, 1994; Obagwu and Korsten, 2003; Pal and Cardener, 2006). Several methods were used to control both two fungus, included chemical (Sinha *et al*, 1993) and biotic (Imran *et al*, 2008) rather than fungicides where castor oil and *Cinnamomum cassia* oil were used to inhibit the growth of *Aspergillus* sp. and *Fusarium* sp (Imran *et al*, 2008). In a study, buds flower powder for Clove used with concentration of (5 g / L) to inhibit the growth of *Alternaria alternates* (Saad, 1997). The addition of the buds flower powder for Clove to the nutritional media (Potato dextrose agar (PDA) at concentration of 0.1% led to inhibition of fungus growth (*pythium aphanidermatum*), while the 0.25% concentration led to the inhibition of *Rhizoctonia solani* in complete inhibition (Wilson *et al*, 1997). Several studies have indicated the role of *Pseudomonas fluorescens* and *Bacillus subtilis* in increasing plant vegetative growth