Rhizobium leguminosarum as a biocontrol agent for controlling soil borne pathogenic *Fusarium oxysporum* on common beans.

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Introduction

The bacteria (*Rhizobium leguminosarum*) are capable of rhizosphere colonization and plant growth acceleration by different mechanisms called (PGPR) (Nigmatullina et al., 2015).

Improvement of plant nutrition by supplementing such major nutrient elements as nitrogen, phosphorus, iron, and/or secreting the substances with antibacterial and antifungal activities, which enhance plant resistance to pathogens (Maksimov et al., 2011).

Root nodule bacteria of genus *R. leguminosarum* which form a nitrogen-fixing symbiosis with legumes (Mongiardini et al., 2008).

Introduction

Common bean (*Phaseolus vulgaris*) is the most important food legume in the world, especially in developing countries (Arnoldi et al., 2015).

Production was 417,000 while demand is 500,000, and The value of the crop sales exceeds US$ 500 million annually (FAOSTAT, 2010; FAO, 2011).

Fusarium wilt and damping off, caused by a soil-borne pathogenic fungus *(fusarium oxysporum*) , is one of the most serious diseases of common beans, causing 50–100% of crop losses due to early wilting (Bakr and Mahdy, 2021).

Introduction

Chemical pesticides widely used and cause great harm to agriculture, the environment, and health (Bakker et al. 2007).

Chemical pesticides cause Alzheimer's disease, reproductive disorder(sterility), Liver damage, mutagenic effects, and brain cancer (Oves et al., 2017).

Chemical fertilizers and pesticides are expensive Continues of using leads fungi to make resistance to fungicide strains (Samago et al., 2018; Kumar ramaiah and Kumar garampalli, 2015).

Biological control is alternative to pesticides, healthy and eco-friendly (Aeron et al., 2011).

Aims of the Study

To determine the antifungal properties of *R. leguminosarum* against *Fusarium oxysporum* in vitro.

To evaluate the antifungal effect of *R. leguminosarum* on wilt disease of beans under glasshouse conditions.

Increase nitrogen amount in the soil and other nutrients such as phosphorus and Iron.

Materials and methods

Sample collection

Collecting common beans root nodules for (*R. leguminosarum*) isolation from the Grdarasha field.

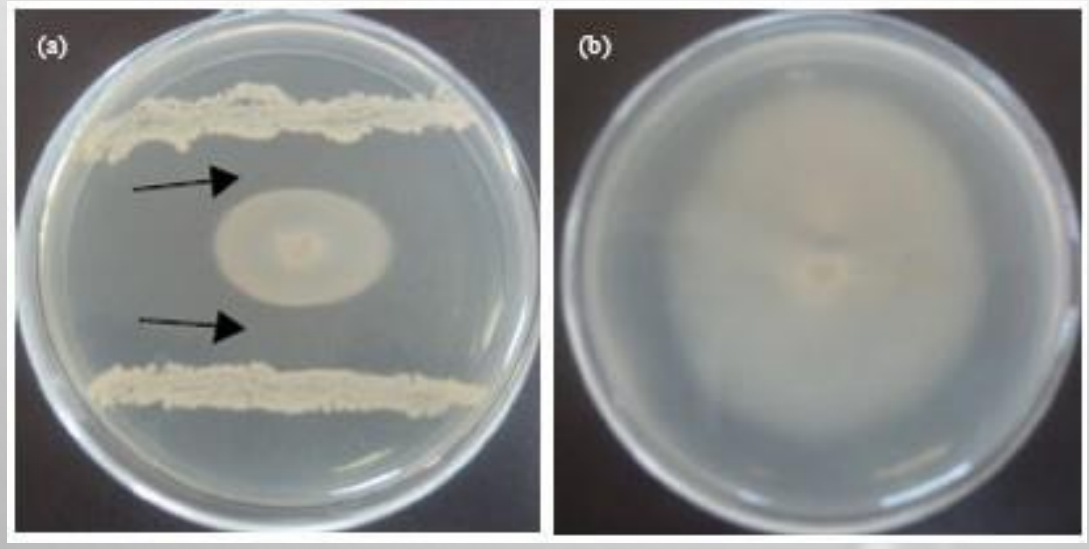
Collecting *Fusarium oxysporum* from plant pathology laboratory, Plant protection department.

Materials and methods

Screening isolated bacteria with the pathogen.

In Vitro Experiment

Screening bacteria against fungi using streak method.



Materials and methods

Producing bio-fertilizer and bio-agent controller carrier.

Liquid formulation

Solid formulation

Materials and methods

In Vivo experiment

Preparing pods for common bean plants.

Collecting free diseased seeds.

Preparing sterilized soil

Adding bacteria isolate and fungi isolate to soil

Experimental Design and Statistical Analysis

All statistics data collecting experiments of this research depending on RCBD.

Expectation result

Induce common bean plant systematic resistance.

Controlling soil-borne pathogens by releasing some compounds.

Increase soil fertility during symbiosis relation, by nitrogen fixation and phosphor solubilizing.

References

*Arnoldi, A., Zanoni, C., Lammi, C. and Boschin, G., 2015. The role of grain legumes in the prevention of hypercholesterolemia and hypertension. *Critical Reviews in Plant Sciences*, *34*(1-3), pp.144-168.

*Bedine Boat, M.A., Sameza, M.L., Iacomi, B., Tchameni, S.N. and Boyom, F.F., 2020. Screening, identification and evaluation of Trichoderma spp. for biocontrol potential of common bean damping-off pathogens. *Biocontrol Science and Technology*, *30*(3), pp.228-242.

*Oves, M., Khan, M.Z. and Ismail, I.M. eds., 2018. *Modern age environmental problems and their remediation*. Cham: Springer International Publishing.

*Ferguson, S., Major, A.S., Sullivan, J.T., Bourke, S.D., Kelly, S.J., Perry, B.J. and Ronson, C.W., 2020. Rhizobium leguminosarum bv. trifolii NodD2 enhances competitive nodule colonization in the clover-rhizobium symbiosis. *Applied and environmental microbiology*, *86*(18), pp.e01268-20.

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