INTERACTIVE EFFECTS OF VIRUS AND RHIZOBIUM ON CHICKPEA GENOTYPES GROWN UNDER EGYPTIAN CONDITIONS

By

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B.Sc. Agric. Sc. (General), Al-Baath University, Syria, 2003
M.Sc. Agric. Sc. (Soil and Land Reclamation), Al-Baath University, Syria, 2009

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ABSTRACT

Maryam Ahmad Al-Achtar. Interactive Effects of Virus and Rhizobium on Chickpea Genotypes Grown Under Egyptian Conditions. Unpublished PhD. Thesis, Department of Agricultural Microbiology, Faculty of Agriculture, Ain-Shams University, 2019.

Chickpea (*Cicerarietinum* L.) belongs to legumes fixing atmospheric nitrogen symbiotically through Rhizobia spp. However, chickpea is highly susceptible to viral diseases, which limits productivity. Therefore, the current study is conducted, in two seasons (2015/2016, 2016/2017) to evaluate the symbiotic efficiency of Mesorhizobia in reducing the damage occurs in chickpea if was infected by chickpea yellow mosaic virus (CpYMV). For this aim, one viral (CpYMV) and two Mesorhizobial isolates (MS3All, MS8All) are isolated from open-fields of chickpea plants. Three chickpea experimental lines (F.07-268, F.07-258 and F.07-44) and one Egyptian cultivar (Giza195) are dually infected by CpYMV and either of MS3All or MS8All. Then, infected plants are grown in pots in open-air at the cultivation area at the Faculty of Agriculture, Ain-Shams University (Shoubra El-kheima). The viral infection had a significant negative effect on shoot length, knot at which branching starts, number of internodes, dry-weight of shoot and plant apical tip and area of the plant leaf compared to the healthy plants. While all previous indicators were increased by inoculation with chickpea rhizobia. The differences were insignificant in the number of branches, whether due to viral infection or rhizobial inoculation. The root system parameters were negatively affected by viral infection, both root length and dry-weight. These indicators were increased during rhizobial inoculation. The number of nodules were decreased, their weight increased from normal weight, their content of leg-hemoglobin was decreased and the activity of nitrogenase decreased, with high significant differences, at viral attack. Rhizobial inoculation had a positive effect on the number of active nodules, the reduction of the negative impact of the virus on nodule weight and the high nodule content of leg-hemoglobin and nitrogenase activity. Plants infected with the virus have yellowed and decreased and its leaf tissue content of chlorophyll A, chlorophyll B and

chlorophyll A + B has decreased, while rhizobia has increased its greenness and increased its chlorophyll A, chlorophyll B and chlorophyll A + B content. Viral infection resulted in a decrease in the content of leaves, roots and seeds and high in nodule content of total nitrogen. Rhizobial inoculation resulted in high content of leaves and seeds, and decreased in nodule content of total nitrogen. Flower formation, fertilization, maturity and reflections on the yield estimate have been reduced by the effect of viral infection. Plant bloom increased and fertilization rate and its maturity increased and thus increase the yield estimate at the rhizobial inoculation. Mesorhizobial isolate (MS3All) surpassed isolation (MS8All) in the length and weight of shoot, leaf area, roots length and weight, number of nodules and activity of nitrogen in it and total nitrogen in the leaves and seeds. The isolates (MS3All) and (MS8All) did not have a significant difference in plant apical tip weight, chlorophyll content, leg-hemoglobin content, number of flowers and pods and yield estimate. Isolate (MS8All) excludes isolate (MS3All) in dry weight of nodules, and total nitrogen in roots and nodules. The genotype (N.F Parents, F. 07-268) was characterized by the highest total nitrogen content in the seeds. The genotype (N.F Parents, F. 07-44) is the largest size of the seeds.

At the end, it is possible to say that the viral infection and rhizobial inoculation, the effect of each in reducing the work of the other.

Key words: *Mesorhizobium* sp., Chickpea, Chickpea yellow mosaic virus.

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