INTRODUCTION

*Oenothera biennis* L. (*Evening primrose*) belongs to family Onagraceae. It is an edible and medicinal plant and has a long history of use as an alternative medicine.


*Simpson* (1994) reported that some *Oenothera* species grown as oil seed crops and to provide drugs for the pharmaceutical industry. *Stuart* (1982) and *Srivastava et al* (1998) reviewed various constituents isolated from *Oenothera* species. These include steroids, terpenoids, fatty acids, flavonoids, tannins, mucilage, resin, bitter principle and potassium salts. *Hulan et al.* (1987) mentioned that evening primrose seeds contained 21 –34 % lipids and high amounts of Ca, P, K, Mg, Fe, Mn, Cu and Zn. Evening primrose seed oil is a rich source of linolenic acid content. *Annual –Report* (1987) stated that the oil percentage in seeds of evening primrose ranged from 15.9 to 26.6% and the percentage of gamma linolenic acid from 9.6 to 12.7%. *Grignac* (1988) reported that seed yield of evening primrose is approx 1.5 –2.0 t/ha, containing 20% total oil and 8.9 % gamma linolenic acid. *Simpson et al.* (1993) found that seeds of evening primrose (*Oenothera* spp) contain 17 –25 % oil of which 7 – 10 % is gamma linolenic acid. *Spitzova and Jehlik* (1993) mentioned that seed oil content of the 13 species of *Oenothera* ranged from 13.9 to 23 % with the gamma liolenic acid content ranging from 4.7 to 9.5 %. *Petru et al.* (1993) noticed that the seeds of *Oenothera biennis* had about 24 % oil content including 2 major fatty acids linolenic acid and gamma- linolenic acid.

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Zygadlo et al. (1994) showed that the seeds of *Oenothera biennis* and *Oenothera indecora* (Onagraceae) contained 18.3 and 16.4 % oil, respectively. Chromatographic analysis showed high level of linoleic acid (> 11.5 %) in the seeds oil. All parts of the plant are edible. The leaves are cooked and eaten as a vegetable. The bark and the leaves are astringent and sedative. They have proved its use in the treatment of gastro-intestinal disorders, whooping cough and asthma. The young roots are sweet succulent and delicious when boiled like potatoes and can be eaten hot or cold. A tea made from the roots is used in the treatment of obesity. Flowers are used as a sweet addition to salads or as a garnish, while young seed pods are steamed. A finely ground powder made from the flowering stems is used cosmetically in face masks to counteract reddened skins. This plant was a staple food for many Native American tribes. Primrose evening oil relieves pain and inflammation. The oil also has a positive effect on the uterin muscles nervous system and metabolism. The seeds are used on bread or in salad, sprinkle over any dish like pepper (Brown 1995). Sayanova et al. (1997) mentioned that gamma linolenic acid (GLA 18.3) is a component of the seed oils of evening primrose (*Oenothera* spp). It is widely used as a dietary supplement and for treatment of various medical conditions.

Srivastava et al (1998) emphasized that, seeds contain the oil, which contains essential gamma-linoleine acid (GLA), a very valuable fatty acid that is non found in many plants and has numerous vital functions in the body and consists of unsaturated fatty acids (anticoagulant substances). This fatty acid (GLA) is known to help prevent hardening of the arteries, hearts disease, eczema, cirrhosis, rheumatoid, arthritis, menopause, multiple sclerosis and high blood pressure. It has a positive effect on sex hormone response including the
hormones estrogen and testosterone. In addition, it is lowering cholesterol levels and is important in treating cirrhosis of the liver. Some chemical components were determined by Duke (1992) in Table (H) in the appendix.

The significant role of chemical fertilizers in increasing the medicinal plants production is fully recognized. However, in the recent years, many constraints have been raised due to their adverse impacts on the public health, environment and National Income. To confront this problem, it was necessary to develop alternative methods of supplying nutrients to the growing plant. The utilization of biofertilizers is considered today by many scientists as a promising alternative particularly for developing countries. Biofertilizers are, generally, based on altering the rhizosphere flora, by seed or soil inoculation with certain organisms, capable of inducing beneficial effect on a compatible host. Biofertilizers mainly comprise nitrogen fixers, phosphate dissolvers or Vesicular Arbuscular Mycorrhizae and silicate bacteria. These organisms may affect their host plant by one or more mechanisms such as nitrogen fixation, production of growth promoting substances or organic acids, enhancing nutrients uptake or protection against pathogens.

Therefore, this investigation aimed to study the effect of biofertilization with nitrogen fixing bacteria, phosphorus dissolvers bacteria, Vesicular Arbuscular Mycorrhizae and their combinations on the growth, yield and the main components of the plant to reveal the