



University of Zabol  
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for the Philosophy degree (PHD) in Agronomy**

**The effect of different tillage systems and Combination of  
Chemical Fertilizer and Manure on Energy efficiency and  
quantitative and qualitative characteristics of Sunflower**

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## **Abstract**

Considering the importance of sunflower in nutrition and industry and the need to study organic and chemical fertilizers under different tillage systems in improving the quality and quantity of oilseed plants, this research was conducted to investigate the effect of tillage and fertilizer on grain yield, quantity and quality of oil, grain nutrients, and energy parameters in sunflower (Shams cultivar). The experiment was performed in the form of split plot with a randomized complete block design in three replications at the research farm of University of Zabol in the two cropping years (2018-2019 and 2019-2020). The main factor was tillage methods (moldboard plow+disc, chisel plow+disc, and disc). The sub-factor included fertilizer levels (no fertilizer application, 100 kg/ha of diammonium phosphate, 25 tons/ha of livestock manure+100 kg/ha of diammonium phosphate, 50 tons/ha of livestock manure+100 kg/ha of diammonium phosphate, 25 tons/ha of livestock manure, 50 tons/ha of livestock manure). The results showed that the highest values in the first year was obtained by use of the 50 tons/ha of livestock manure + 100 kg/ha of diammonium phosphate in tillage with moldboard plow+disc for 1000-grain weight, and 50 tons/ha of livestock manure in tillage with disc for grain yield and oleic acid. The highest values in the second year was obtained from the 25 tons/ha of livestock manure in tillage with moldboard plow+disc for 1000-grain weight, 100 kg/ha of diammonium phosphate in tillage with moldboard plow+disc for grain yield, and 100 kg/ha of diammonium phosphate in tillage with chisel plow+disc for oleic acid. Application of 100 kg/ha of diammonium phosphate in tillage with chisel plow+disc produced the highest amount of nitrogen in grain and the application of 50 tons/ha of livestock manure in tillage with disc produced the highest amount of potassium in grain. In general, considering the reduction of tillage and increasing the characteristics of sunflower, it is possible to consider 50 ton per hectare of manure in disk tillage to improve grain yield as a suitable 1000-grain weight harvest index. Considering conventional tillage, The treatment of diammonium phosphate 100 kg/ha is suitable for improving the amount of nitrogen, phosphorus and calcium in the grain and the weight of 1000 grains, oil percentage and oleic acid percentage. and considering the energy, it is possible to treat the application of diammonium phosphate 100 kg/ha in the usual tillage of the index of productivity, added energy and high energy consumption efficiency.

**Keywords:** Cow manure, Disk, Energy use efficiency, Grain nutrients, Linoleic acid.