Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 3 [7] June 2014: 54-57

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE

Influence of Nitrogen and Vermicompost on Grain and Oil Yield of Rapeseed CV. RGS003

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ABSTRACT
Rapeseed is one of the most important annual crops contains high value of oil and protein. This experiment was conducted using nitrogen (0, 100 and 200 kg/ha) and cow manure vermicompost (0, 5, 10 and 15 t/ha) in a factorial experiment based on randomized complete block design (RCBD) with three replications at a field in Borazjan, State of Bushehr, Iran. Nitrogen and vermicompost altered grain yield, seed protein percentage, seed oil percentage and oil yield of rapeseed cultivar RGS003 significantly. Under our experimental conditions, nitrogen (100 kg/ha) + vermicompost (15 t/ha) can be recommended and used as efficient levels to improve grain yield and oil yield.
Key words: organic fertilizers, inorganic fertilizers, Brassica napus, oil plant, nutrients.

Received 01.03.2014 **Revised 19.04.2014** **Accepted 10.05.2014**

INTRODUCTION

Rapeseed (*Brassica napus* L.) from Brassicaceae family is one of the most important annual oil and protein crops in temperate climates. It has high value of oil (40-45%) and protein (39%) [1]. In ranking, rapeseed oil is third behind soybean (*Glycine max* L.) and oil palm (*Guineensis elaeis*) showing the importance of this product. Apart from direct human and animal consumption, industrial uses include the manufacture of rapeseed oil or use as a source of bio-diesel fuel production have been developed in the recent years in world [2,3]. Its production has been notably extended during recent years in Iran [4].

Availability of nitrogen is important for growing plants. It is a main constituent of protein and nucleic acid molecules. It is also a part of chlorophyll molecules. It is well known that the use of fertilizer helps in production and is a quick method resulted in the best yields [5,6].

In vermicomposting process, earthworms are used to enhance the process of residue conversion. Vermicomposting is faster than composting and the resulting earthworm castings are rich in microbial activity and plant growth regulators, and fortified with pest repellence attributes as well. Vermicomposting reduces the C:N ratio and retains more N than the traditional methods of preparing composts. It can improve seed germination, growth and yield of crops [7,8,9]. Edwards and Arancon (2004) reported that the vermicompost applications suppressed the incidence of the disease significantly [10].

Previous studies by researchers showed influence of vermicompost and inorganic fertilizers on yield and protein of crops [11,12].

The subject of this experiment was evaluation of the effects of nitrogen and vermicompost levels on yield, protein and oil of rapeseed.

MATERIALS AND METHODS

Plant materials and experimental conditions

This experiment was carried out using nitrogen (0, 100 and 200 kg/ha) and cow manure vermicompost (0, 5, 10 and 15 t/ha) in a factorial experiment based on randomized complete block design (RCBD) with three replications at a field in Borazjan, State of Bushehr, Iran. Each plot (1.2×2 m) contained 4 rows with spacing of 30 cm between rows. The cultivar RGS003 of rapeseed was selected for this study.

Vermicompost was mixed with soil of the plots before planting. The source of nitrogen was urea applied as three equal doses. At the end of growth, five plants of two middle rows of each plot were randomly harvested for measurement of grain yield. Fifteen grams of grains of each plot was used for determining of oil and protein percentage.

Statistical analysis

Data from the experiment were subjected to analysis of variance (ANOVA) using SPSS computer software and the means compared with Duncan's new multiple range test (DNMRT) at $P < 0.05$.

RESULTS AND DISCUSSION

Nitrogen and vermicompost altered grain yield, seed protein percentage, seed oil percentage and oil yield significantly (Figure 1-4).

The highest value of grain yield was achieved on 200 kg N/ha+15 t vermicompost/ha which was not significantly different when compared to 100 kg N/ha+15 t vermicompost/ha, 200 kg N/ha+10 t vermicompost/ha and 200 kg N/ha+5t vermicompost/ha (Figure 1).

The maximum seed protein percentage was obtained at 100 kg N/ha+15t vermicompost/ha which was significantly different when compared to 0 kg N/ha+5 t vermicompost/ha and 0 kg N/ha+0 t vermicompost/ha (Figure 2).

Seed oil percentage was maximum at 100 kg N/ha+5 t vermicompost/ha (Figure 3).

The highest value of oil yield was achieved on 200 kg N/ha+15t vermicompost/ha which was not significantly different when compared to 100 kg N/ha+15t vermicompost/ha, 200 kg N/ha+10 t vermicompost/ha and 200 kg N/ha+5t vermicompost/ha (Figure 4).

There are experiments in agreement with present study. Vasanthi and Kumaraswamy (1999) revealed that paddy grain yields were high by application of vermicompost plus NPK [11]. Manivannan et al. (2009) indicated that application of vermicompost with inorganic fertilizers improved yield and protein of *Phaseolus vulgaris* seeds [12].

Vermicompost can provide all nutrients in readily available form and also enhances uptake of nutrients by plants [9]. The uptake of nitrogen can improve when was applied in combination with vermicompost [13]. Atiyeh et al. (2000) found that compost was higher in ammonium, while vermicompost tended to be higher in nitrates, which is the more plant-available form of nitrogen [14].

The application of vermicompost favourably affects soil pH, microbial population and soil enzyme activities [15] which all of them can affect biosynthesis of compounds. Vermicompost and organic fertilizers increased protein content of peanut and vitamin C in marionberry, strawberry, and corn [16,17].

Vermicompost affects on soil physical properties [18]. It improves soil structure, texture, aeration, and waterholding capacity.

vermicompost includes plant-growth regulators which increase growth and yield [19]. Excreta of earthworm were rich of Micro-organism especially bacteria and contain large amounts of plant hormones (auxin, gibberellin and cytokinin) which affect plant growth and development [20].

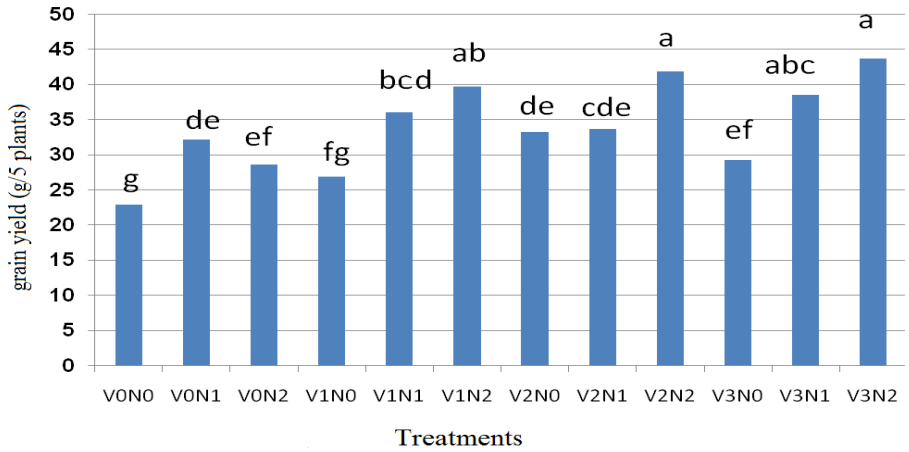

Figure 1: Effect of nitrogen and vermicompost on grain yield of rapeseed.

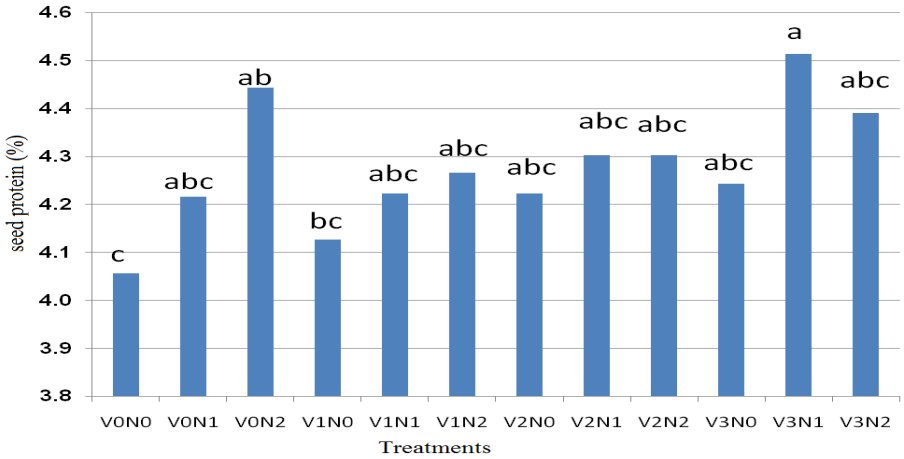

Figure 2: Effect of nitrogen and vermicompost on seed protein percentage of rapeseed.

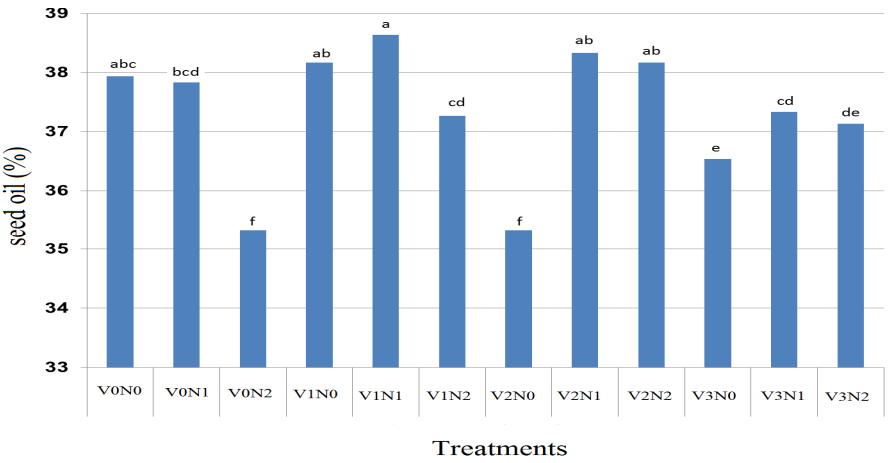

Figure 3: Effect of nitrogen and vermicompost on seed oil percentage of rapeseed.

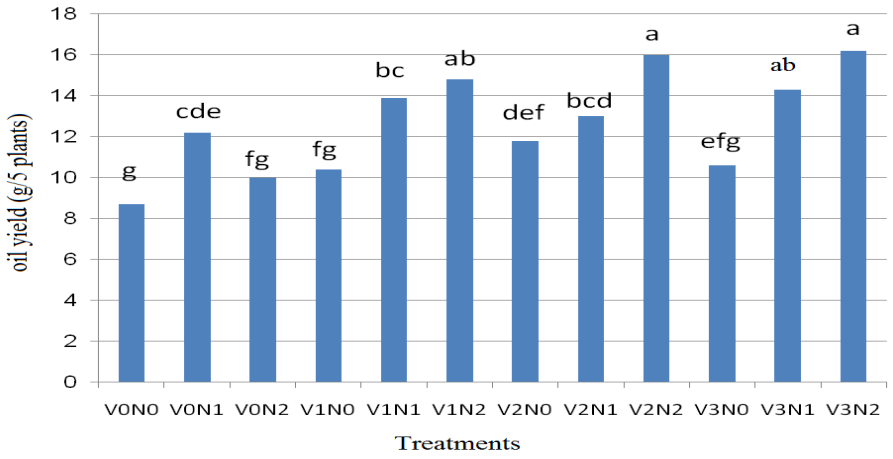

Figure 4: Effect of nitrogen and vermicompost on oil yield of rapeseed.

CONCLUSION

In conclusion, under present conditions, nitrogen (100 kg/ha) + vermicompost (15 t/ha) can be recommended and used as efficient levels to improve grain yield and oil yield and to avoid unfavorable effects of high nitrogen levels.

ACKNOWLEDGEMENT

We would like to thank the chief of Narges Oil Company of Shiraz for measurement of seed oil percentage and the chief of Bushehr Agriculture and Natural Resources Research Center, Borazjan for measurement of seed protein percentage.

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Citation of This Article

Mehdi Z, Shahram S, Mokhtar Z, Mahdi Z.Influence of Nitrogen and Vermicompost on Grain and Oil Yield of Rapeseed CV. RGS003.. Bull. Env. Pharmacol. Life Sci., Vol 3 [7] June 2014: 54-57