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Evaluation The Effect of Pomegranate Pulp of Mixed Alag type with Cow Manure on Eisenia Fetida Worms

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ABSTRACT

In order to use produced pomegranate pulp in food industry, it is better to consume these remnants to produce organic fertilizers such as Vermicomposting. In this experiment after drying and grinding, pomegranate with ratios of 50%, 40%, 30%, 20%, 10% and control (without pomegranate pulp) mixed with cow manure. Then 100 Eisenia fetida mature earthworms were added to each six experimental unit. These experimental units were kept at 25 ˚C, 75% moisture –holding capacity of water during 80 days. The results showed that higher percentages of pomegranates pulp prevent E. fetida's proliferation and development and it disrupts vermicomposting. Maximum pomegranate pulp which does not reduce E. fetida worms' population is its 30% density. To accelerate the vermicomposting process, it is better that pomegranate pulp density is between 10% to 20%, because it is less effective on worms' proliferation and development.

Keywords: Pomegranate Pulp, Proliferation, Cow Manure, Vermicomposting, Eisenia Fetida

I. INTRODUCTION

Pomegranate with scientific name as Punica grantum belongs to punicacea species and it is one of the oldest known fruits which is widely cultivated in Mediterranean countries such as Turkey, Egypt, Tunisia, Spain, Morocco and countries like Iran, Afghanistan, India and partially in China, Japan and Russia (Onur, 1995). According to statistics of Ministry of agriculture in 2003, the most important producing provinces on the basis of cultivation and in descending order are Fars, Khorasan, Isfahan, Markazi, Yazd, Kerman, Semnan and Tehran. Pomegranate is one of the fruits which can be consumed as fresh fruit like citrus and apple. This fruits has vitamins such as B1, B2, B6 and C and also elements like Calcium, phosphorus and Manganese which balance body fluids, especially blood. Various experiment indicate that experimentally 80-85% of the weight of the pomegranate pellets includes its juice or extract form including glycoside, lipids, organic acid, tannins, and various vitamins and soluble minerals (Mirjalili, 2003). Due to the beneficial properties of pomegranate tend to use this fruit, in particular, pomegranate juice and other processed products such as fruit concentrate, fruit paste, etc has increased day by day which consequently, related industries dependent on production of this fruit has also increased. This factor has caused many pomegranate juice and concentrate factories produce significant amounts of waste. In addition to environmental problems, these remains cause sad and unpleasant sights in nature (Garcia, 2010). The waste produced by these plants, pomegranate peel contains polyphenols substances like Alajyk acid, Tannins and Gallic acid and Anthocyanin (Farhush, 2003; Antoun et al., 1997; Gu et al., 2001; Kaya et al., 1993; Mohamed et al., 1998; Mohd Zin et al., 2002). But wastes produced in these factories are much more than their need in the mentioned industries. Therefore, producing pomegranate factories proceed to bury burn or abandon their waste in the nature which this leads to damage environment. To avoid this phenomenon, it is better that these remains are used to produce organic fertilizers such as vermicomposting. In addition, the

production of these fertilizers prevents environment pollution, create jobs, generate added value and avoid waste of energy and country's capital. Some changes in the remains of organic minerals can proportionate them for use on land and optimized usage in environment. The compost of natural material is a mixture with an organic material which is done by micro-organisms continuous process in a hot and humid environment with air flow and organic materials change into sustainable material which is called humus or compost; in the other hand, compost production is a process of biodegradation of waste under controlled conditions (Haimi & Hutha, 1987). The organic materials in one place for proliferation and subsequent use in agriculturally is done by farmers in different cultures in centuries. In Europe, the use of waste compost to enhance soil fertility goes back to Roman times. It is reported that compost making is the most effective approach to control and manage the remains of organic materials (Bhattacharjeectal, 2002; Dickerson, 2001; Aira et al., 2006). Vermicomposting, as the term indicates, is a kind of produced vermicomposting with the help of earthworms which creates as a result of change in survivors partial digestion through cross in digestive organ of these animals. Because earth worms can grow and multiply fast and have significant potential for the use of waste organic material, such materials are often annoying and polluting the environment, convert to a high quality organic fertilizer. Products which are labeled vermicomposting are organic materials with adjusted PH and full of humus substances and nutrients in the absorbable form for a plant and a variety of different vitamins and growth promoting hormones of plant and different enzymes (Kale et al., 1992). The most important benefits of vermicomposting are buffering property that prevents PH fluctuations during ingredients uptake by plant (Bowman & Reinecke, 1991). Vermicomposting has a potential property to hold water and it can, because of organic acid, solve the nutrients in the soil, especially micro-nutrient elements such as iron through the complex process and provides it to the plant (Reinecke & Vilijoen, 1990). Also, vermicomposting is able to stabilize heavy elements in the soil and prevent excessive absorption by the plant and improve the biological, physical and chemical properties of soil that its results are a positive impact on the quality and quantity performance of product. Vermicomposting has high and specific surface area and provides strong absorption and maintenance of nutrients (Cardetral, 2004). Humus-vermicomposting has organic materials stability, absorption of water and nutrients to feed plants and release water during drought. Vermicomposting contains nutrients in the absorbable form for plants such as Nitrogen, exchangeable Phosphorus, Potassium, and Calcium and solved Magnesium (Edwards et al., 1972). In addition to producing organic fertilizer, vermicomposting production process also is able to produce a second product called biomass earthworm which can be used as a source of protein to feed the livestock and poultry (Alikhani, 2006). Vermicomposting does not have environmental pollution and adverse effects of chemical fertilizers. This fertilizer is extremely useful for growing crops and increases the performance of cultivated crops (Alikhani, 2006). Vermicomposting is a harmless fertilizer and does not have any negative effect on the ecosystem. Repellents by worms often contain Nitrogen, Phosphorus and Potassium at a rate of 5 to 11 times is higher than soils without worm. Therefore, worms play a beneficial and constructive role in the soil. Vermicomposting can control plant diseases. Another benefit of vermicomposting is that during its production the population of phathogens greatly reduces (Atiyeh et al., 2000). According to research, one of the most famous compost maker worms is Eisenia fetida that its body composition includes 63% protein, 11% fat, 6%ash, and nitrogen-free extract 19% (Ebadi et al., 2005). Vermicomposting generally lasts 6 to 12 weeks. The rate of decomposition of organic materials depends on many factors such as the nature and amount of organic materials, temperature, the used system and the ration of the amount of worm to the amount of organic materials (Ebadi et al, 2005). In recent years, various studies are done on vermicomposting from organic waste materials. In a study by Kavshyk and Grag, the potential of Eisenia fetida earthworm was investigated to decompose textile sludge mixed with cow manure and agricultural waste materials. In this study, the highest rates of growth and reproduction of earthworms was observed in area which only contained cow manure. It was also found that the vermicomposting process has significant impact in reducing the C/N ration and increasing the percentage of K, P, N and Ca bedding materials. Despite studies in the field of compost and vermicomposting production of different organic residues, fertilizers production from pomegranate pulp is not considered. Moreover, related industries to those products generate significant quantities of pomegranate pulp in the country each year.

Vermicomposting can be produced from these remnants, in addition to preventing pollution, provides employment, generates added value and avoids waste of energy and country's capital. To do this, investigation of chemical properties of pomegranate pulp for the production of compost and vermicomposting is significant.

II. METHODS AND MATERIAL

First, pomegranate type of algal samples collected from Saveh gardens and resulted pulp dried away from sunlight for a week. Then, pulps by using grinding have been completely powered until digestion will be easy for worms. In order to leave harmful compounds and come down EC, cow manure was completely rotten and four times washes with tap water with intervals of 12 hours. In this experiment, Eisenia fetida earthworm was used for vermicomposting. This experiment with different ration of pomegranate pulp and cow manure was designed and implemented in six pilot units weighing three kilograms. The first pilot units, 50% fruit pulp contains 1500 grams of fruit pulp; second pilot unit 40% fruit pulp contains 1200 grams of fruit pulp, the third pilot, 30% of the pulp contains 900 grams of fruit pulp, the fourth pilot unit, 20% of the fruit pulp contains 600 grams of fruit pulp, the fifth pilot test, 10% of fruit pulp contains 300 mg and sixth only contains 3 kilograms of cow manure (control). After producing the desired ration of manure and pulp, provided content was thoroughly mixed to wet saturated surface. In each experiment, 100 manure worms were added after 24hours. All experimental units were kept in a room at 25˚C with 75% moisture-holding capacity of water for 80 days and were gently mixed for aeration of organic materials in the pilot units with one week intervals. After the end of vermicomposting, mature worms population, the number of cocons (worm eggs) and infant and immature worms in each of the experimental units were counted.

III. RESULT AND DISCUSSION

Considering that the aim of this study was to evaluate the effect of pomegranate pulp on biomass earthworms, the investigation of earthworms' reproductive changes was important in the first place. The number of eggs and infant worms' population determine breeding rate of earthworms. The number eggs represents earthworms tend to reproduce and the number of population of infant worms indicates that context conditions are suitable to change these eggs to earthworms. Regarding to different percentages of pomegranate pulp, worms showed different responses so that in the first test unit (the highest rate of fruit pulp) were completely destroyed. Also by reducing the amount of pomegranate pulp in bed, proliferation and growth of earthworms increased as well. Table [1] shows the population and the number of worms and infants in this experiment.

Table 1 Population and the number of worms cocons E. fetida different than cow manure and pomegranate

Experiment Unit	1 pomegranate pulp %50	2 pomegranate pulp %40	3 pomegranate pulp %30	4 pomegranate pulp %20	5 pomegranate pulp %10	6 control (cow manure)
No. mature earthworms	--	24	44	105	124	134
No. cocons	--	101	189	292	354	382
NO. Newborn earthworms	--	189	346	810	1101	1149

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