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The Effect of Eucalyptus Tree Wastes Mixed with Cow Manure on Eisenia Fetida Worms' Population

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ABSTRACT

To use the waste components of eucalyptus tree, this debris is used to produce organic fertilizers like vermicompost. In this experiment, Eucalyptus waste, after drying and grinding, was mixed in the ratio of 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10%, 5% and control (without Eucalyptus) with cow manure. Then, more than 100 species of Eisenia fetida earthworms were added to each six experimental unit. Experimental units were maintained at 25 ° C with relative humidity of 75% water holding capacity for 80 days. The results showed that the high percentages of eucalyptus wastes inhibit proliferation and the growth of E. fetida earthworms and vermicomposting. Maximum concentration of Eucalyptus waste does not decrease the population of worms was 15 percent. To expedite the vermicomposting process, it is better that eucalyptus waste is between 10 to 5 percent because it is less effective on population and the proliferation of worms.

Keywords : Eucalyptus, Manure, Vermicomposting, Eisenia Fetida

I. INTRODUCTION

Eucalyptus belongs to the Myraceae family in the world, including more than 740 species, which 500 species have essence. The leaves and essence of many species of eucalyptus are used to treat respiratory tract such as bronchitis or croup (Juergens et al., 2003; Kaspar et al., 1994). Eucalyptus trees are beautiful in different areas of the Mediterranean that reaches to a height of 35 to 40 meters, but it grows to a height from 80 to 100 meters in Australia and Tasmania and even more. As examples of these trees are listed to a height of 150 meters in different books. The characteristics of this tree includes hard and durable wood, skin is yellowish brown color and is easily separated from the stem. Whether this tree leaves belongs to the young plant or the young or elderly branches, has different forms. In young branches, leaves are cross, horizontal and are almost devoid of petiole. In older trees, leaves have individual state on the stems and each ends to a 2 to 3 cm narrow petiole (Zargari, 1997). The leaves or essence of some forms of eucalyptus are applied for malaria and typhoid fever caused by (typhoid) and the treatment of certain skin inflammations, such as burns and ulcers (Reynolds et al., 1982). Eucalyptus essence and its main composition, -1,8 Syntol, are widely used in the preparation of smoothing cream, ointments, cough syrups, toothpaste and as a flavoring in other medicines as well as aromatic substances in soaps, powders and detergents and in very small amounts in perfumes. Eucalyptus oil also has anti-inflammatory and antioxidant effects (Juergens et al., 2003). Eucalyptus has coincided with the arrival of anguishes to Khuzestan in Iran, but its cultivation has officially started in the northern region in 1310 (Asare et al., 2007) and now a significant level of land has allocated to itself in the north, center and south of the country. And the wastes produced in the trees are much more than they need in the industry are listed. So, they try to bury, burn or drop the waste in the wilderness. It also eventually causes damage to the environment. To avoid this phenomenon, it is better that the debris is used in order to produce organic fertilizers such as compost and vermocompost. In addition to prevent environmental pollution, these fertilizers production creates employment, value-added production and prevents energy waste and becomes the country's capital.

Some changes in organic debris can optimize them for use on land and optimized usage in environment. Compost is an organic material originating from mixed

natural ingredients which have been done in a continuous process by microorganisms in hot and humid and airy environment and organic matter is dumped into sustainable matters called humus or compost, in other words, composting is a biodegradable waste process under controlled conditions (Haimi & Huhta, 1987). Piling organic matter in one place for analysis and subsequent use in agriculture was carried out by farmers for centuries in different cultures. In Europe, the use of compost wastes to enhance soil fertility goes back to Roman times. It is reported that composting is the most effective way to control and manage organic debris (Bhattacharjee et al., 2002; Dickerson, 2001; Aira et al., 2006). Vermicompost, so that the term points, is a kind of produced compost with earthworms assistant that it comes into existence as a result of the transformation and partial digestion of its remain passing through the digestive tract and the ability of some earthworms in the consumption of residues between animals. Because earthworms can grow and multiply very fast and have considerable potential for consumption of organic waste, such materials are often a nuisance and pollute environment, they change these material into organic matters with outstanding quality. Products that are called vermocompost are organic material qualitatively with a pH adjusted, rich in absorbable humic substances and nutrients for plants and have a variety of vitamins and growth stimulants and hormones for plant and different enzymes (Kale et al., 1992). The most important benefit of vermicompost is having a buffering effect which will prevent pH fluctuations during elements attraction by plant (Bowman & Reinecke, 1991). Vermicompost has the property of increasing the water storage potential, due to organic acids contained in, it capable of dissolving nutrients in the soil, especially micro-elements like iron through the complexion and provides to the plants (Rienecke & Vilijoen, 1990). Vermicompost also is able to stabilize heavy metals in the soil and prevents excessive absorption by the plant and improves the biological, physical and chemical properties of soil, resulting in a positive impact on qualitative and quantitative performance in product. Vermicompost has a high specific surface area and provides attraction and retaining strong nutrients (Card et al, 2004). Humus vermicompost has stability of organic matter, adsorption of water and nutrients for plant nutrition and releasing water during drought. Vermicompost contains absorbable nutrients for plants (such as nitrates, exchangeable phosphorus, potassium, calcium and magnesium solution) (Edwards et al., 1972). In addition to the production of organic fertilizer, vermicompost production process has the ability to produce a second product called the earthworm biomass as a source of protein that can be used to feed livestock and poultry (Alikhani, 2006). Vermicompost does not have environmental pollution and the adverse effects of fertilizers. This fertilizer is incredibly useful to grow crops and will increase crop yields (Alikhani, 2006). Vermicompost is a harmless fertilizer and does not have any adverse impact on the ecosystem. Substances excreted by worms often contain nitrogen, phosphorus and potassium at a rate of 5 to 11 times higher than soils without worm. Therefore, worms play a useful and productive role in soil. Vermicompost has a character of plant diseases controller. Another benefit is that the process of vermicompost production greatly reduces the pathogen population (Atiyeh et al., 2000). According to the research, one of the most famous composting worms is Eisenia fetida species that body composition is as follows: 63% protein, 11% fat, 6% ash and extract nitrogen free 19% (Ebadi et al. 2005). Vermicompost production generally takes 6 to 12 weeks. The rate of decomposition of organic matter depends on many factors such as the nature and amount of organic matter, temperature, production system and the amount of worm used to the amount of organic matter (Ebadi et al., 2005). Vermicompost production have been ever reported from organic debris such as leaves horn and sawdust (Banu et al., 2005), alfalfa residue (Mousavi and Raeesi, 2009), sugarcane (Sangwan et al., 2010), corn dough (Musaida et al., 2012), solid waste (Manyuchi et al., 2013), various kitchen, agricultural and industrial waste (Singh et al., 2013; Ebadi et al.,2006), garden waste and weeds (Sitre, 2014) and bagasse (Aquino et al., 1994). In all cases listed, different percentages of cow manure was added for accelerating the vermicompost process and production of qualified fertilizers. Because manure is one of the best substrate for the growth and activity of Eissentia fetida worms (Siddique et al., 2005; Loh et al., 2005; Garg et al., 2006). Despite various studies in the field of production of vermicompost from different organic residues, production of these fertilizers from eucalyptus leaves is not considered. Regarding the fact that most vegetation of the country, especially the southern provinces, Sistan and Baluchestan, is this plant and annually significant amounts of dry leave and waste

are generated from these trees. In addition to produce Vermicompost the residue and preventing environmental pollution, it will create jobs, value added production and prevents energy waste and the country's capital. Therefore, Vermi-compost produced from Eucalyptus waste is important.

II. METHODS AND MATERIAL

Eucalyptus tree waste was collected and prepared from the trees in Chahnimeh Institute. Then these wastes were powdered by mill so that waste digestion became easy for worms. Also composted cow manure in order to leave harmful substances and come down Ec, were washed with tap water four times at intervals of 12 hours. The fetida Eisenia earthworms were used for vermicomposting. This experiment with different proportions of Eucalyptus tree waste and cow manure in six experimental units was designed with weight-of three kilograms. The first test unit contains 1500 grams of 50% Eucalyptus tree waste, the second unit contains 1350 grams of 45% Eucalyptus tree waste, the third unit contains 1200 grams 40% Eucalyptus tree waste, the fourth test unit contains 35% eucalyptus contains 1050 grams of waste Eucalyptus tree, the fifth test unit contains 30% eucalyptus 900 grams of eucalyptus waste, Eucalyptus waste reduces in pilot units, respectively, which increases the amount of cow manure so that the latest test unit just contained three kilograms of cow manure (control). After preparing the proportions of cow manure and eucalyptus, the prepared content was swirled thoroughly and was wet to saturation levels. In each experimental unit, 100 adult worms were added after 24 hours. All experimental units were maintained in a room at 25 ° C with relative humidity of 75% water holding capacity for 80 days. And for aeration of organic materials contained in the pilot units were mixed with intervals of a week gently. And after the end of vermicomposting, the population of adult worms, the number of cocoons and population of neonatal and immature worms were counted in each experimental unit.

III. RESULT AND DISCUSSION

Considering that the aim of this study was to evaluate the impact of Eucalyptus tree wastes on earthworms' biomass, the study of earthworms mating changes was in the forefront. Cocoons number and population of the baby worms determine the amount of earthworms breeding. Cocoon population represent the earthworms tend to reproduce and the population of baby worms indicates appropriate conditions in the context to convert these cocoons to the earthworms. Worms showed different reactions to different than percentage of eucalyptus wastes. So that they completely disappeared at the first, second, third, fourth, fifth, sixth, seventh and eighth test unit (in order from left to right with the highest eucalyptus) Table 1. Also, by reducing the amount of Eucalyptus in the substrate, the proliferation and growth of earthworms was increased.

Table 1 : population and Cocoons number of E. fetida Worms and Different ratios of cattle manure and Eucalyptus waste products

1	2	3	4	5	6	7	8	9	10	11
eucalyptus % 50	% 45 eucaly ptus	% 40 eucal yptus	% 35 eucaly ptus	% 30 eucaly ptus	% 25 eucal yptus	% 20 eucal yptus	%15 eucaly ptus	% 10 eucaly ptus	% 5 eucal yptus	control (cow manure)
--	--	--	--	--	--	--	39	94	132	141
--	--	--	--	--	--	--	187	273	357	403
--	--	--	--	--	--	--	347	648	976	1247

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