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Effect of seasons and different substrates on growth and reproduction of the compost worm *Eisenia Fetida*

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ABSTRACT

The experiment was carried out in a factorial arrangement with the base of randomized complete block design in three repetitions. The first factor consisted of 11 bed for eating worm and the second factor is the different seasons (spring and autumn) respectively. Traits was including number of capsules (Coconut), the number of adult worms, the number of immature worms, live worms masses (mg), maximum weight per worm (mg) and the average number of outgoing cases per capsule (Coconut), respectively. The results showed that the interaction between the incubator × seasons was significant for all traits. So the highest average in 80% sheep manure + wheat straw 20% was observed in the spring. It was conclude that changes in different contexts breeding seasons and has a great effect on the measured traits Maximum biomass, maximum activity was obtained in the spring mating and the number of capsules and the season tiny capsules Unexpectedly a winter was produced by the adult worm.

Keywords: Environment, *E. fetida* worm and worm biomass.

1- INTRODUCTION

It is well established that earthworms have beneficial physical, biological and chemical effects on soils and many researchers have demonstrated that these effects can increase plant growth and crop yields in both natural and managed ecosystems (Edwards, 1998). These beneficial effects have been attributed to improvements in soil properties and structure (Kahsnitz, 1992), to greater availability of mineral nutrients to plants (Gilot, 1997), and to increased microbial populations and biologically active metabolites such as plant growth regulators (Doube *et al.*, 1997). In recent years, the applied use of earthworms in the breakdown of a wide range of organic residues, including sewage sludge, animal wastes, crop residues,

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and industrial refuse, to produce vermicomposts has increased tremendously (Kale, 1998). The earthworms fragment the organic waste substrates, stimulate microbial activity greatly and increase rates of mineralization, rapidly converting the wastes into humus-like substances with a finer structure than composts but possessing a greater and more diverse microbial activity, commonly referred to as vermicomposts (Atiyeh *et al.*, 2000). The effects of vermicomposts on the growth of a variety of crops including cereals and legumes, vegetables, ornamental and flowering plants have been assessed in the greenhouse and to a lesser degree in field crops (Thankamani *et al.*, 1996). These investigations have demonstrated consistently that vermicomposted organic wastes have beneficial effects on plant growth independent of nutrient transformations and availability. Whether they aroused as soil additives or as components of horticultural soilless container media, vermicomposts have consistently improved seed germination, enhanced seedling growth and development, and increased plant productivity much more than would be possible from the mere conversion of mineral nutrients into more plant-available forms. The greatest plant growth responses and yields have occurred usually when vermicomposts constituted a relatively small proportion (10–40%) of the total volume of the plant growth medium in which they are incorporated. Usually, greater proportions of vermicomposts substituted in growth media have not increased plant growth as much as smaller proportions (Subler *et al.*, 1998). There are very few data in the literature on possible mechanisms by which vermicomposts produce these growth enhancement effects. However, it has been shown that the incidence of plant diseases can be limited by vermicomposts (Nakamura, 1996); the activity of vesicular carbuncular mycorrhizae is enhanced (Cavender *et al.*, 1999), and plant parasitic nematode populations are suppressed. Additionally, there are a number of references in the literature that show that plant growth regulators, suc as in dole-acetic acids (auxins), gibberellins and cytokinins, are produced by microorganisms, and there have been suggestions that the promotion of microbial activity in organic matter by earthworms would result in production of significant quantities of plant growth regulators (Krishnamoorthy and Vajranabhiah, 1986). Earthworm activity accelerates the humification of organic matter, and their influence in increasing microbial populations enhances the presence of auxins and gibberellin-like substances as well as humic acids (Casenave de Sanfilippo *et al.*, 1990). Moreover, humic acids have also been shown to stimulate plant growth in auxin, gibberellin and cytokinin bioassays (Phuong and Tichy, 1976). Vermicomposts originating from animal manures, sewage sludges or paper-mill sludges have been shown to contain large amounts of humic substances (Elvira *et al.*, 1998). Studies of the positive effects of these humic substances on plant growth, when full requirements for mineral nutrition, have resulted in consistently positive effects on growth independent of nutrition (Chen and Aviad, 1990). For instance, in controlled experiments, humic substances increased dry matter yields of corn and oat see dings (Albuzio *et al.*, 1994); numbers and lengths of tobacco roots (Mylonas and Mccants, 1980); dry weights of shoots, roots, and nodules of soybean, peanut, and clover plants (Tan and Tantiwiramanond, 1983); vegetative growth of chicory plants (Valdrighi *et al.*, 1996); and induced shoot and root formation in tropical crops grown in tissue culture (Goenadi and Sudharama, 1995). The typical growth response curves that have been reported to result from treating plants with humic substances show progressively increased growth with increasing concentrations of humic substances, but there is usually a decrease in growth at higher concentrations of the humic materials (Chen and Aviad, 1990). Hypotheses accounting for this stimulatory effect of humic substances at low concentrations are numerous, the most convincing of which hypothesizes a ‘‘direct’’ action on the plants, which is hormonal in nature, together with an ‘‘indirect action’’ on the metabolism of soil microorganisms, the dynamics of uptake of soil nutrients, and soil physical conditions (Chen and Aviad, 1990). Other mechanisms which have been suggested to account for promotion of plant growth by humic substances include: enhanced uptake of metallic ions and increases in cell permeability (Chen and Aviad, 1990). During the last decade, the biological activities of humic substances, particularly those derived from earthworm feces, have begun to be investigated (Dell’Agnola and Nardi, 1987). So try this experiment are due to different seasons and different substrates on the growth and reproduction of the compost worm *Eisenia fetida* mechanisms are examined.

2- MATERIALA AND METHODS

This experiment was carried out in the company milk and livestock Kangavar, located Kangavar located in Kermanshah province, 10 kilometers East of the city Kangavar the geographical 47° 82'- 48° 06' eastern longitude and geo 34° 43'- 34° 56' North has been implemented. An altitude of 1470 meters above sea level and the average annual rainfall in the region 395.1 mm in year. The city's cold climate is semi-arid with an average annual is temperature of 13.3 ° C in 2012. The following table of statistics for climate research has shown that where the experiment took place. The experiment was carried out in a factorial arrangement with the base of randomized complete block design in three replications.The first factor consisted of bed for eating worm (includes: 1 - cow manure, 2 - sheep manure, 3 - 20% wheat straw + 80% cow manure 4 - 80% sheep manure + wheat straw 20%, 5 - 80% cow manure + 20% pea Straw, 6 - 80% sheep manure + 20% pea straw, 7 - 80% cow manure + 20% Fruit and vegetable waste 8 - 70% cow manure +15% corn straw + 15% Sawdust, 9 - 70% cow manure +15% Glycyrrhizin glare + 15% wheat straw, 10 - 70% sheep manure + 15% corn straw + 15% cardboard waste and 11 - 70% sheep manure + 15% Glycyrrhizin labra + 15% Sawdust) and the second factor is the different seasons (spring and autumn), respectively. The traits measured included the number of capsules (Coconut); the number of adult worms was the number of immature worms, live worms masses (mg), maximum weight per worm (mg) and the average number of outgoing cases per capsule (Coconut). Remnants of industrial and agricultural waste require factories and workshops were prepared. Inscription from the industrial town of pulp, manure, wheat straw, corn remains the company's website vermicomposting residues in milk and animal Kangavar pea straw market selling vegetables from the vegetable waste Kermanshah city Kangavar and sawdust from the shop Kangavar sawmills located in the city was prepared . Numbering about a thousand pairs of worm compost maker (*E. foetida*) stack of vermicomposting dairy and livestock Kangavar were collected participate. And a plastic container that contains small amounts of material was transferred to the substrate. In order to establish proper drain out excess water, drill a hole through the bottom of plastic containers. Before filling the bucket with the desired substrates, livestock manure and other raw materials, substrates, chopped into smaller size. The material produced per certain weight and weighing each treatment was pooled. The mixing was done manually and evenly. Minimum height of 25 cm was filled with useful materials. Plastic floor drain partly out of the water, the water was completely soaked. For each container, 10 pieces of worm composting formed it maker, mature sex ring was removed and weighed and then added to each dish 33.10 cream 5 g weight was considered. In order to accurately weighed, then washed with water and then with a dry cloth worms were placed on the weighing scales, worms were placed on the substrate surface. After entering into the worm beds, beds were watered with distilled water. For each dish separately with rushing for entering into the bed flies and spawn, they were wearing. Plastic containers were placed in a suitable environment for open and fully covered with two layers of Hemp Sack. On the likelihood of heavy rains and the long-term addition, a layer of plastic bags were pulled on them. Bed weeks depending on environmental conditions alike of water were sprayed 1-2 times. All the steps were carried out in spring and fall alike and it continued till 110 days. Testing of 15 April began at the site in spring and the first sampling date was 10 May month. Sampling took place later in the timeline above. The site began Fall 10 September and 5 October first biopsy was performed. At the end of each period mechanism capsule *Eisenia foetida* by hand from materials inside the plastic container was removed and after washing and drying, counted and weighed. Then the test data normality, 11×2 factorial analysis of variance is investigated. Significance between means was tested using Duncan Multiple Range Test. A probability value of $P \leq 0.05$ indicated that the difference was statistically significant. MSTATC and 16 SPSS software using statistical calculations and plotting graphs were done using EXCEL software.

3- RESULTS AND DISCUSSION

Analysis of variance of the data showed significant effects of seasons (spring and autumn) and bed for eating worm on number of capsules, the number of adult worms, the number of immature worms, worm biomass and average maximum weight per worm.Significant ($p\leq0.05$) seasons × bed for eating worm interaction on number of capsules, the number of mature worms, the number of immature worms, worm biomass and average maximum weight per worm were observed (Table 1).

Table 1- Analysis of variance of traits

SOV	df	Number of capsules	The number of mature worms	The number of immature worms	Worm biomass	Average maximum weight per worm
Replication	2	0.488	0.603	0.470	0.189	0.002
A	10	506.96**	75.80**	87.66**	189.18**	0.042**
B	1	1588.88**	8.76**	437.87**	391.52**	0.39**
A×B	42	102.74**	0.777**	1.62**	4.2**	0.004**
Error	-	1.21	0.384	0.280	0.234	0.002

* and ** are significant at 5 and 1 % probability levels, respectively

The maximum number of capsules was in the spring in treatment 80% sheep manure + wheat straw 20% and treatment 70% sheep manure + 15 % glycyrrhizins glare + 15% sawdust counting the number of capsules was lowest in autumn (Fig. 1). Fernandez *et al* (2006) also conducted to evaluate the response of earthworms to the surface E. foetida seasons change the worm population dynamics over a year, the number of adult worms in the manure beds, immature, infant and capsule counting and weighing the different treatments and tiny winter was produced by the adult worm. These results suggest that the worm E. foetida able to allocate resources to grow food or in response to changing environmental conditions is a reproduction. The maximum number of mature worms in treatment 80% sheep manure + wheat straw 20% in the spring and in the 70% sheep manure + 15 % Glycyrrhizins glare + 15% Sawdust was implemented in the autumn to lowest number of manure worms indicated (Fig. 2). In these experiments it appears that the addition of wheat straw feeding is beneficial for the growth and proliferation of the worm has a secondary role. High nitrogen materials such as animal manures are plenty of earthworms and a significant population increase (Evans and Galyd, 1948). The maximum number of number of immature worms was in the spring in treatment 80% sheep manure + wheat straw 20% and treatment 70% sheep manure + 15 % glycyrrhizins glare + 15% sawdust counting the number of capsules was lowest in autumn (Fig. 3). Gapta and Garg (2008) reported that infant's produce worm compost maker is greatly influenced by the type of waste. The main parameters that are used to identify optimal conditions for biomass worms are earthworms. The maximum worm biomass in treatment 80% sheep manure + wheat straw 20% in the spring and in the 70% sheep manure + 15 % Glycyrrhizins glare + 15% Sawdust was implemented in the autumn to lowest number of manure worms indicated (Fig. 4). Fernandez *et al* (2006) reported that in the spring than in other seasons worm biomass was highest. Suthar (2009) showed that the nitrogen of the substrate material is higher than the growth of worms. The maximum average maximum weight per worm in treatment 80% cow manure + 20% Fruit and vegetable waste in the spring and in the 70% sheep manure + 15 % Glycyrrhizins glare + 15% Sawdust was implemented in the autumn to lowest number of manure worms indicated (Fig. 5). Factor was in increased weight of the worm for the food and the environment. Domínguez *et al* (2003) reported an average daily weight of the worm depends on the density, population and food.

4- CONCLUSION

The highest average in 80% sheep manure + wheat straw 20% was observed in the spring. From the results the present study it can be conclude that changes in different contexts breeding seasons and has a great effect on the measured traits Maximum biomass, maximum activity was obtained in the spring mating and the number of capsules and the season tiny capsules Unexpectedly a winter was produced by the adult worm.

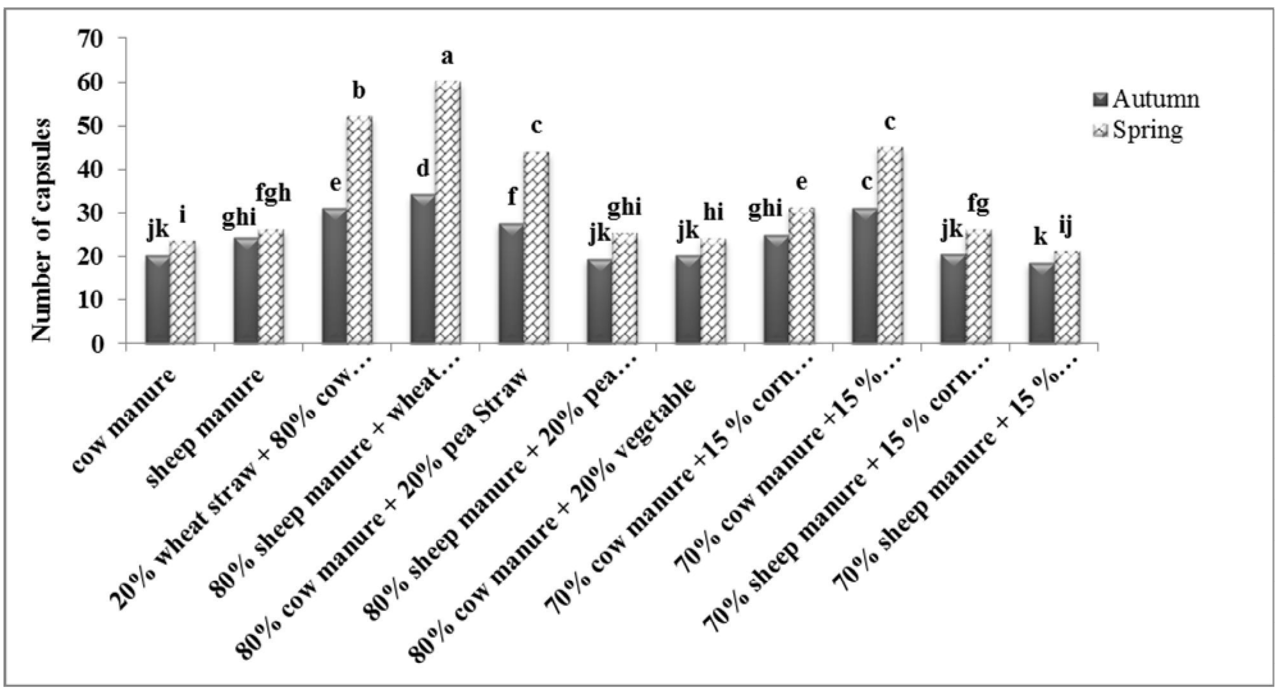

Fig 1 - Comparison of the mean number of capsules in two seasons (autumn and spring) with different substrates vermicompost.

Means, for each planting date, followed by similar letter are not significantly different at the 1% probability level- using Duncan´s Multiple Range Test.

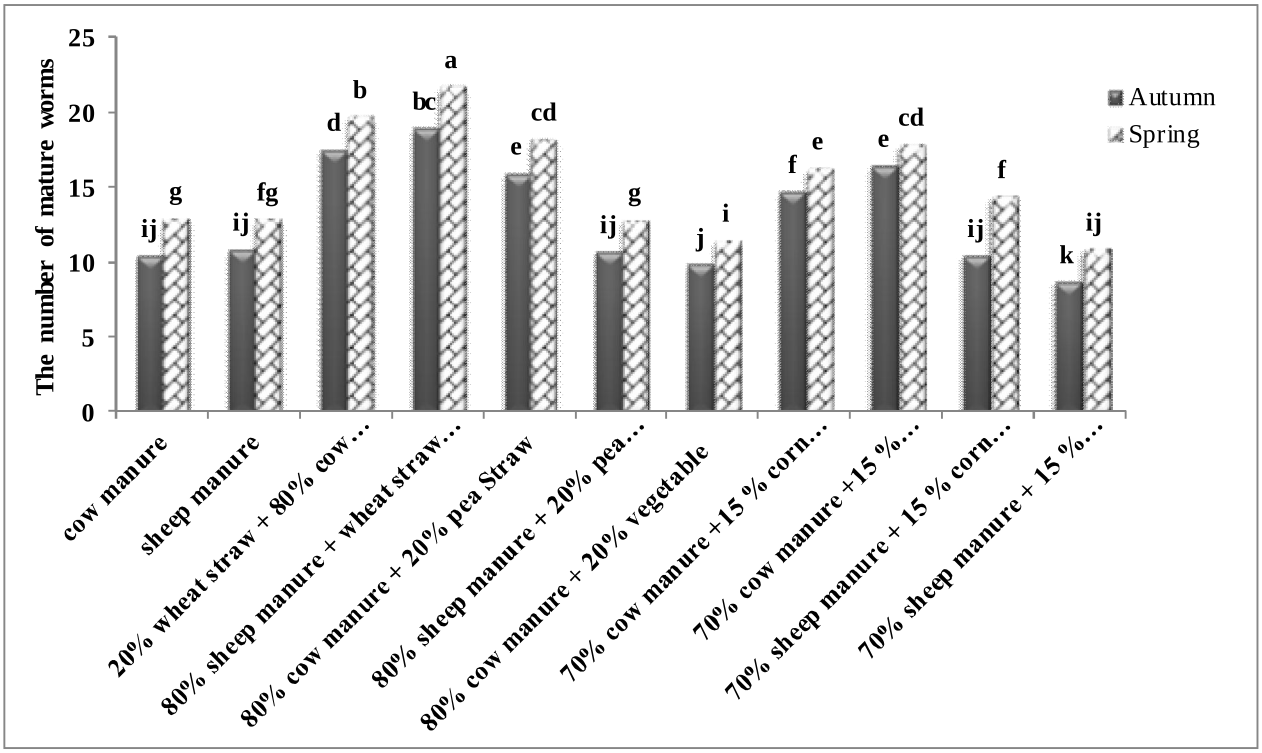

Fig 2 - Comparison of the mean the number of mature worms in two seasons (autumn and spring) with different substrates vermicompost.

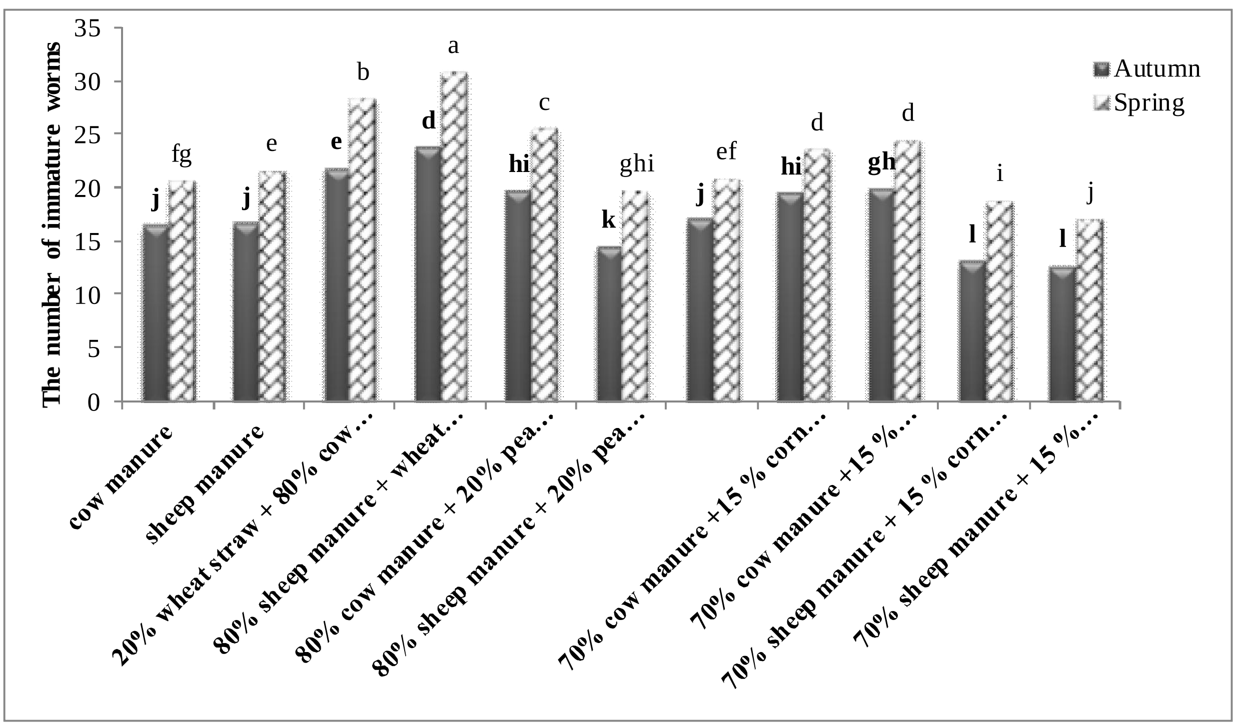

Fig 3 - Comparison of the mean the number of immature worms in two seasons (autumn and spring) with different substrates vermicompost.

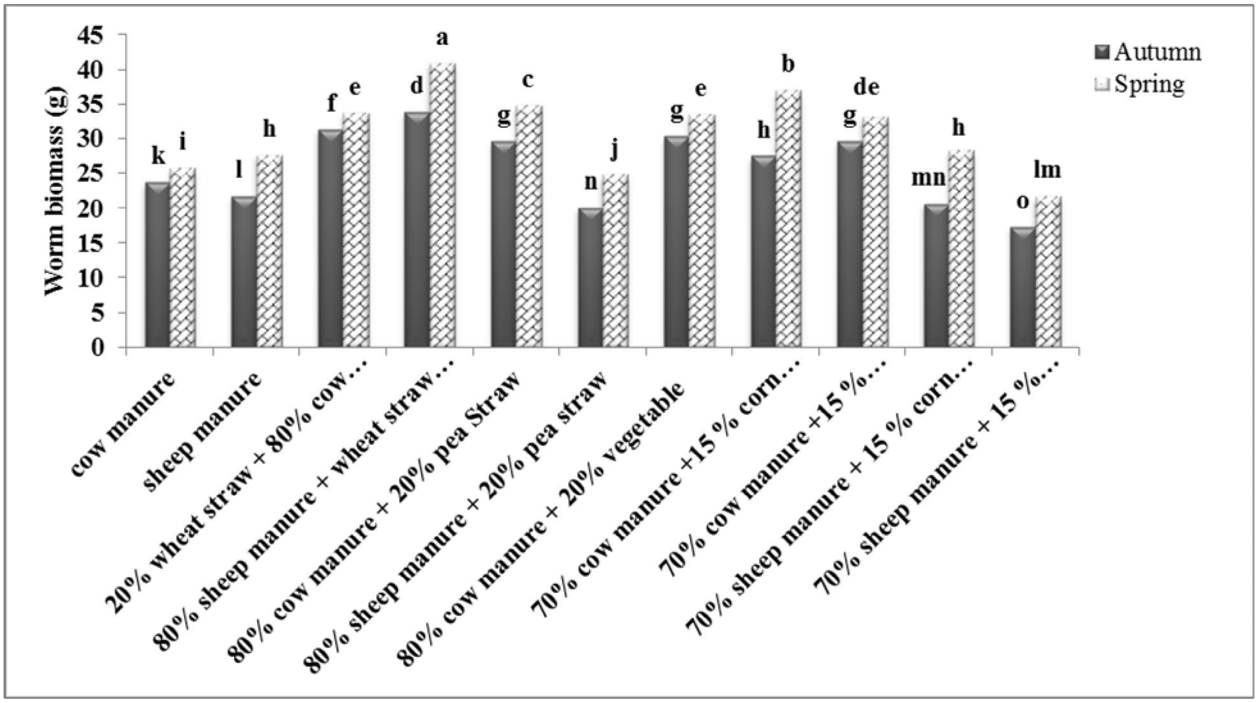

Fig 4 - Comparison of the mean the worm biomass in two seasons (autumn and spring) with different substrates vermicompost.

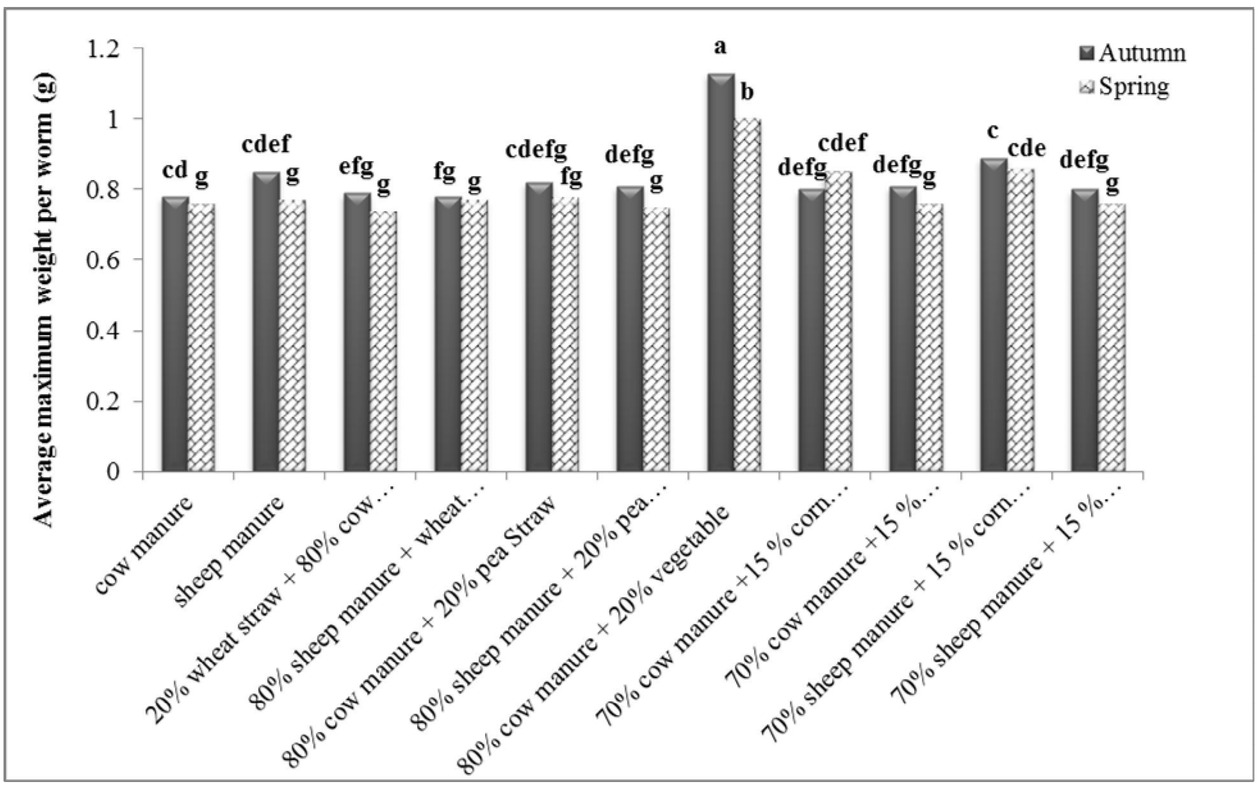

Fig 5 - Comparison of the mean the average maximum weight per wormin two seasons (autumn and spring) with different substrates vermicompost.

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