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BARRIERS AND LIMITATIONS OF USING VERMICOMPOST BY GREENHOUSE OWNERS IN PAKDASHT COUNTY

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ABSTRACT

The purpose of this survey research was to examine barriers and limitations of using vermicompost by greenhouse owners in Pakdasht County. The method of this study was descriptive-correlative type. The statistical population were all the greenhouse owners in Pakdasht County (N=860) which according to Cochran formula 160 subjects were selected by using stratified sampling method. Validity of questionnaire was confirmed by experts and specialists and reliability estimated through a pilot test with 30 questionnaires, Cronbach's alpha coefficients were calculated for different parts between 0.79 to 0.94.Data analysis was performed using SPSS version 19. The results of the Pearson correlation test showed that there was a negative and significant relationship in 99% level among educational-informational, technical and political barriers in using vermicompost. The results of stepwise multi-regression showed that educational-informational, technical and political barriers explained 65% changes of dependent variable variance (using vermicompost).

Keywords: Barriers, Vermicompost, Greenhouse, Pakdasht County

INTRODUCTION

In recent years, the use of natural compounds of plant origin instead of chemical compounds and peat has increased. Peat because of characteristics such as low pH and lack of appropriate water holding capacity after drying cannot be used for all plants. Also, due to ecological damage to the environment and lack of economical beneficial for producers of ornamental plants, its use is disputed. This problem has led researchers to think about the substrates with suitable quality and inexpensive (Krumfolz et al., 2000).

However, there has been increasing environmental and ecological concerns against the use of peat because its harvest is destroying endangered bog ecosystems worldwide. Other organic materials such as manure compost, vermicompost, rice hulls ash, tea waste, cotton boll, coconut coir dust, and so on determined suitable components for growing media (Agbo and Omaliko, 2006; Ercisli et al., 2005; Sahin et al., 2004).

The results of several long-term studies have shown that the addition of compost improves soil physical properties by decreasing bulk density and increasing the soil water holding capacity (Weber et al., 2007). Moreover, in comparison with mineral fertilizers, compost produces significantly greater increases in soil organic carbon and some plant nutrients (Bulluck et al, 2002, Nardi et al., 2004, Weber et al., 2007).

Unlike compost, vermicompost is produced under mesophilic conditions, and although microorganisms degrade the organic matter biochemically, earthworms are the crucial drivers of the process, as they aerate, condition and fragment the substrate, thus drastically altering the microbial activity. Earthworms act as mechanical blenders, and by fragmenting the organic matter they modify its physical and chemical status by gradually reducing the ratio of C:N and increasing the surface area exposed to microorganisms - thus making it much more favorable for microbial activity and further decomposition (Dominguez et al., 2010).

Today, the use of organic fertilizers such as vermicompost and useful terrestrial organisms is the most natural and desirable way to keep the alive system and active life in the soil of agricultural lands (Shadanpour et al., 2011). The use of vermicompost in ornamental plants beds can lead to decrease in peat consumption and production cost of ornamental plants (Arancon et al., 2004; Loh et al., 2004).

The ability of some species of earthworm to consume and breakdown a wide range of

organic residues such as sewage sludge, animal wastes, crop residues and industrial refuse is well known (Kaushim and Garg, 2003; Bahrampour and Sharifi Ziveh, 2013). The use of organic amendments such as traditional thermophilic compost has been recognized generally as an effective means for improving soil aggregation, structure and fertility, increasing microbial diversity and populations improving the moisture – holding capacity of soils, increasing the soil Cation Exchange Capacity (CEC) and increasing crop yields (Marinari et al., 2000).

Earthworms vermicompost is proving to be highly nutritive 'organic fertilizer' and more powerful 'growth promoter' over the conventional composts and a 'protective' farm input (increasing the physical, chemical & biological properties of soil, restoring & improving its natural fertility) against the 'destructive' chemical fertilizers which has destroyed the soil properties and decreased its natural fertility over the years. Vermicompost is rich in NKP (nitrogen 2-3%, potassium 1.85-2.25% and phosphorus 1.55-2.25%), micronutrients, beneficial soil microbes and also contain 'plant growth hormones & enzymes' (Anonymous, 2009).

Vermicomposts are products derived from the accelerated biological degradation of organic wastes by earthworms and microorganisms. Earthworms consume and fragment the organic wastes into finer particles by passing them through a grinding gizzard and derive their nourishment from microorganisms that grow upon them. The process accelerates the rates of decomposition of the organic matter, alter the physical and chemical properties of the material, leading to a humification effect in which the unstable organic matter is fully oxidized and stabilized (Arancon & Edwards, 2005; Orozco et al., 1996). Plants fertilized with vermicompost have shown greater ability to assimilate essential macro and micro nutrients, and resulted into improved root development (Atiyeh et al., 2001; Arancon et al., 2006).

Various greenhouse and field studies have examined the effects of a variety of vermicompost on a vide range of crops including cereals and legumes (Kaushik and Garg, 2003), vegetable (Subler et al., 1998; Atiyeh et al., 2000), ornamental and flowering plants (Atiyeh et al., 2000) and field crops (Arancon et al., 2004).

Some studies showed that increases in growth and yield at low amounts of vermicompost in the potting medium could probably be due to improvement in the physicochemical properties of the container medium, increase in enzymatic activity,

increases in microbial diversity and activity, nutritional factors and plant growth (Arancon et al., 2004; Atiyeh et al., 2000).

Results obtained from this experiment revealed that growth and yield parameters such as leaf area, dry shoot weights and weight of fruits were significantly by applying vermicompost. Arancon et al. (2004) reported positive effects of vermicompost on the growth and yield. And yield in strawberry, especially increases leaf area, shoot Dry weight and fruit weight in field conditions.

Chamani et al. (2008) investigated the effects of vermicompost on growth and flowering satin in a greenhouse. The results showed that vermicompost had a significant positive effect on flower number, leaf growth, and shoot fresh and dry weight as compared with grown plant in soil without vermicompost. The highest yield was observed in 20% vermicompost.

Golchin et al. (2006) believe that the nutritional value of the vermicompost is dependent on its origin. They reported that vermicomposted animal manures tend to have a higher nutritional status, compared with that derived from organic municipal waste.

Mishra et al. (2005) showed that vermicompost had beneficial effects on growth and yield of rice, especially caused significant increase of many growth parameters, seeds germination, chlorophyll concentration and yield.

Walker and Bernal (2008) reported that application of compost and organic fertilizer dramatically increased growth of best branch. The effect of vermicompost on plant growth is through effect on photosynthesis and various products of plants such as leaves, stem and root to stimulate the material stored in the leaves and nutrients uptake and water by roots.

Cavender et al. (2003) showed that vermicompost indirectly through the impact on soil micro flora will affect on plant growth. For example, adding vermicompost to the growth medium containing peat increases the colony formation of mycorrhiza.

So considering the importance and benefits of vermicompost, the purpose of this study is to identify the barriers and limitations of using vermicompost by greenhouse owners in Pakdasht County. In order to achieve overall purpose, the following specific objectives are considered:

- Describing the personal characteristics of greenhouse owners (age, education level, job experience);

- Assessment of educational-informational, technical and political barriers in using vermicompost by greenhouse owners;
- Assessment of changes of using vermicompost by independent variables.

MATERIALS AND METHODS

The methodology used in this study was correlation and descriptive method. The total population for this study was all greenhouse owners in Pakdasht city (N=860). Based on the Cochran formula, 160 greenhouse owners were selected as sample of the study by using stratified sampling.

From review of literature, the researchers of the study developed a questionnaire to collect data. Content and face validity of questionnaire were established by a panel of experts consisting of university faculty members and some specialists in experts in the field of bio-fertilizers. A pilot study was conducted with 30 greenhouse owners for determining the reliability of questionnaire. Computed Cronbach's Alpha scores were from 0.79 to 0.94 which indicated that the questionnaire was highly reliable.

According to the objectives of the study, dependent variable was the using of vermicompost. In order to measure the dependent variable, a five point Likert-type rating scale was used. The independent variables were some of individual and occupational characteristics, educational-informational, technical and political barriers. Data analysis was done in two descriptive and inferential statistic levels by SPSS/19. In descriptive level, through statistical measures such as frequency, percentage, average, variance and standard deviation and in inferential level Pierson correlation coefficient and regression analysis have been used.

FINDINGS

The results of this study show that the mean age of the respondents was 42 years; most frequency was between 42-47 years. Most of the greenhouse owners had diploma (53.8%). The mean of work experience of greenhouse owners was 19 years; most frequency was between 8-13 years.

The results of this study indicate that the most important educational-informational barriers of using vermicompost: lack of information and knowledge in the field of vermicompost, low literacy or illiteracy of greenhouse owners, and lack of educational-extension courses about vermicompost. While barriers such as lack of skills of greenhouse owners in using vermicompost, and shortage of specialists and experts in the field of vermicompost are less important barriers (table 1).

The results of this study indicate that the most important political barriers of using vermicompost: top-down planning regardless of problems of greenhouse owners, lack of belief managers and officials to vermicompost, and lack of comprehensive planning in using vermicompost in agriculture. While barriers such as uncontrolled import of earthworms and increasing non-native earthworms and lack of government supervision on the quality of vermicompost production are less important barriers (table 2).

Table 1- Ranking of educational-informational barriers of using vermicompost

Barriers	Mean	SD	CV %	Rank
Lack of information and knowledge in the field of vermicompost	4.28	0.45	10.51	1
Low literacy or illiteracy of greenhouse owners	4.48	0.50	11.16	2
Lack of educational-extension courses about vermicompost	4.09	0.85	20.78	3
Inappropriateness teaching methods in the field of vermicompost	3.75	0.78	20.80	4
Difficulty in access to essential information in the field of vermicompost	3.89	0.84	21.59	5
No introduction of vermicompost in the mass media	3.71	0.81	21.83	6
Lack of knowledge about vermicompost among the greenhouse owners	3.26	0.73	22.39	7
Lack of specialized books and articles about vermicompost	3.65	0.83	22.73	8
Lack of skills of greenhouse owners in using vermicompost	3.70	0.86	23.24	9
Shortage of specialists and experts in the field of vermicompost	3.66	0.91	24.86	10

Table 2- Ranking of political barriers of using vermicompost

Barriers	Mean	SD	CV %	Rank
Top-down planning regardless of problems of greenhouse owners	3.98	0.73	18.34	1
Lack of belief managers and officials to vermicompost	3.20	0.62	19.37	2
Lack of comprehensive planning in using vermicompost in agriculture	3.72	1.00	26.88	3
Lack oflaws relating tointellectual propertyofbio-fertilizers	3.06	0.94	30.71	4
Lack of formal and legal authority in the field of bio-fertilizers	3.26	1.03	31.59	5
Government policies focus on increasing production without considering environmental degradation	3.40	1.13	33.23	6
Lack of government supervision on the quality of vermicompost production	2.75	1.00	36.36	7
Uncontrolled import of earthworms and increasing non-native earthworms	2.15	1.12	52.09	8

The results of this study indicate that the most important technical barriers of using vermicompost: lack of access to vermicompost, inappropriate species of earthworms to produce vermicompost, and easy access to fertilizers. While barriers such as lack of national standards for vermicompost, and easy application of

chemical inputs are less important barriers (table 3).

In this research to consider the relationship between independent and dependent variables Pierson coefficient were used. The data of table 4 shows that the educational-informational barriers, technical barriers and political barriers have negative and significant relation with using vermicompost (table 4). These findings have been confirmed by some studies such as Razzaghi Borkhani et al. (2010), Baide (2005) and Dhaliwal et al. (2004).

Table 3- Ranking of technical barriers of using vermicompost

Barriers	Mean	SD	CV %	Rank
Lack of access to vermicompost	3.98	0.44	11.05	1
Inappropriate species of earthworms to produce vermicompost	4.43	0.58	13.09	2
Easy access to fertilizers	4.11	0.57	13.86	3
Lack of morphological and molecular characteristics for vermicompost	4.40	0.62	14.09	4
Lack of suitable sites for the storage of vermicompost	4.20	0.70	16.66	5
Improper quality of vermicompost available in market	4.23	0.73	17.25	6
Lack of national standards for vermicompost	3.81	0.74	19.42	7
Easy application of chemical inputs	3.99	0.78	19.54	8

Table 4- Relationship between using vermicompost and independent variables (n=160)

Variables	Correlation Coefficient	r	Sig.
Educational-informational barriers	Pearson	-0.501**	0.000
Technical barriers	Pearson	-0.562**	0.000
Political barriers	Pearson	-0.643**	0.000

**** Significant in 0.01 level; * Significant in 0.05 level**

According to the results of regression analysis, in first step *educational-informational barrier* was entered in the equation that the multiple regression coefficient (R) was 0.531 and determining coefficient was 0.400. It means that 40 percent of changes of using vermicompost are explained by this variable. In the next step, *technical barrier* was entered in the equation. This variable increased the multiple regression coefficient of (R) to 0.635 and determining coefficient to 0.550 percent. Actually, this variable can explain 15 percent of changes of dependent variable. In the third step, the variable of *political barrier* was entered in the equation that showed 0.700 of regression coefficient and 0.653 of determining coefficient. This variable can explain 10.3 percent of changes in dependent variable (tables 5).

Table 5- Determining coefficients of effective variables in using vermicompost

step	R	R^2	R^2Ad
1	0.531	0.400	0.411
2	0.635	0.550	0.551
3	0.700	0.653	0.645

Table 6- Effect rate of variables in using vermicompost

variables	B	*Beta*	t	Sig.
Constant	-1.200	—	3.313	0.0001
Educational-informational barriers	-0.022	-0.297	-3.652	0.000
Technical barriers	-0.350	-0.225	-4.900	0.000
Political barriers	-0.653	-0.309	-6.122	0.000

The results of the regression analysis shows that after entrance of all independent variables which had significant correlation with dependent variable, the variables of educational-informational, technical and political barriers remained. These three variables can totally explain 65.3 percent of changes of the dependent variable. Of course, other changes are related to other elements which have not been studied in this research. So, According to the results, the linear equation of regression would be as follow (table 6):

$Y=1.200+0.022X_1+0.350X_2+0.653X_3$

CONCLUSION

Vermicompost is a technology that uses the specific types of the earth-worms. Due to their high growth and reproduction potential, the earth-worms can be turned into a unique organic fertilizer. Slowly and steady pass of this matter from the digestive system of the earth-worm and mixing with the various oozing of the digestive system, produces matters that are different from the other matters. These matters, called vermicompost, contain full of humus matter, absorbable nutrient elements, various vitamins, growth-stimulant hormones, and various enzymes. Vermicompost is in from of black granular odorless and is produced commercially in most countries.

The findings of regression analysis also showed that 65.3% of variance of using vermicompost by greenhouse owners was explained by three variables of educational-informational, technical and political barriers. According to the findings of study, the following practical suggestions are recommended:

- Establishment of a formal and legal reference for quality control of bio-

fertilizers and continuous improvement of an effective legal system to create a legal and regulatory framework for development of these fertilizers;

- Assess the quality of fertilizers based on national standards before the market entry by a skilled staff;
- Introducing and promoting bio-fertilizers, especially vermicompost and its advantages over chemical fertilizers by using audio-visual media;
- Developing national standard for bio fertilizers.

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