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UCT Journal of Research in Science, Engineering and Technology

UCT. J. Resea. Scien. Engineer.Techno. (UJRSET)

Volume 4,Issue1 *31-36 (2016)* *ISSN 2382-977X*

Management of cover crops of cold cereal, on total fresh weight, total dry weight weed, yield and yield components peppermint

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Original Article:
Received 22 March. 2016 Accepted 28 April. 2016 Published 3 May. 2016

ABSTRACT

To study the effect of cover crop and how manage cover crop an experiment was conducted in Agricultural Research Center of University of Mohaghegh Ardabili , the experiment was factorial based on complete randomized block design with three replications. winter cover crops and spring cover crops as the main factor with six levels(winter wheat, spring wheat, winter barley , spring barley, winter rye, winter rye+ winter barley) and how manage cover crop with three levels (living mulch, heading mulch, mulch with herbicide) as a second factor. For comparison, two controls (without cover crop with weeding weeds and without cover crop without weeding weeds) was aside experiments. The results showed that main effect of type cover crop on the number of branches, leaf fresh weight, leaf dry weight of peppermint and also the total dry weight of weeds and at the first stage of sampling, Had a significant impact. The main effect of management was significant for all traits measured. However, the interaction of cover crop in how management cover crop were not significant. Winter wheat highest number of branches, leaf fresh weight, leaf dry weight of peppermint, relative to other levels of cover crops. In the first stage sampling is obtained by winter rye, the lowest total weed weight relative to other levels. Spring barley, winter rye the lowest total weed dry matter to create than other cover crop. All three methods to manage of cover crops the most affected by weeds dry weight compared to control. (no weeding and no cover crop weed)

Keyword:
Cover crop, mulch, cover crop management, weed, peppermint, Yield

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Peer review under responsibility of **UCT Journal of Research in Science, Engineering and Technology**

INTRODUCTION

During the time of medicinal plants as a source of food and medicinal uses. (Zargari, 1993). In this century, extensive research conducted on medicinal plants and drugs of natural origin new horizons for doctors, pharmacists and researchers have opened. Mint plants including medicinal plants is due to the effects of multiple drugs has long attracted the attention of researchers (Niyakan and et al, 2004). Peppermint from family *Lamiaceae* herbs that are used in a wide range of including the industries pharmaceutical, food and health. United States of America's largest manufacturer is Peppermint. Peppermint oil exports in the United States of America and India in the years 2002-2003 was approximately 85,000 tonnes (Zargari, 1997). Peppermint is originated from the Mediterranean region and has published widely in the United States of America and India (Foster, 1999). Today, in many countries more than one million pounds in the plant is created and their degree of importance and develop their culture in different parts of the planet to show (Hay and Waterman, 2000). During the growth of herbs, struggle with weeds is essential. So destroying them will not only accelerate the growth and development of plants., but the easier to harvest and quality drugs can also increase . Proper use of chemicals to combat weeds, herbs and the correct choice of herbicides for this purpose is essential. and in this case, great care must be taken because the chemical herbicides on plants are not built specifically for use (Omid-begay, 1995). Weed competition is important for manufacturers of organic products (Delate and Mckern, 2005). Weed control is one of the most important aspects of production in any agricultural system. Throughout the history of farming are several ways to combat the weeds have experienced. But today, because of their greater tendency to use methods the minimum and the lack of timely tillage due to increased levels farms than in the past and reduce the choice of a variety of products for cultivation, the use of herbicides to combat weeds is increasingly more.. Although chemical control of weeds the only cure and the best way to solve the problem weeds and their management does not. Regular use of herbicides with side effects and several recommendations today to develop sustainable agricultural systems and protect the environment, it is less important (Rashid mohasel and et al, 2009). Organic weed management options such as tillage, mulching, flamethrower and allelopathic plants such as rye is (Delate and Mckern, 2005). Cover crop (living mulch) to contribute significantly to the management of weeds (Moore and et al ,1994). The term cover crop as a generic term that includes a wide variety of plants., the various environmental benefits, except for the main crop growing can be used and may grow during the period when the main crop to be grown not and or may be simultaneously or during the main crop growing season. term, including green manure, plant smodering, living mulch and plant catch and plant forage a specific reference to the use of a cover crop (Teasdale et al, 2007). Cover crops has several effects on agroecosystem (Sarrantonio and Gallandt, 2003). Many of the benefits of using cover crops is well known. Caused them to control water and wind erosion, maintain soil moisture by reducing evaporation and increasing infiltration, increased fertility, recycle nutrients, add nitrogen if it is a legume, improve soil structure and increase soil organic matter content provides. Some cover crops can also increase the mulch to control weeds with allelopathic substances that inhibit the growth of weeds and might attribute (quality) environment, especially the protection of surface water and groundwater, and in some cases eliminate the need for herbicides before germination can improve. (Worsham, 1991). One of the best winter rye cover crops to compete with weeds, especially small seeds, annual weeds sensitive to light such as *Chenopodium*, *Red root Pigweed*, *Velvetleaf*, *Chickweed* and the *Foxtail* is. Rye also allelopathic substance prevents to (as a natural weed killer) of many grass weeds such as *Taraxacum* and *Canada thistle*.

Methods and materials

The trial in the 2011 crop year farm research 'Mohaghegh Ardabili' was performed. Accordance with the recommendations of the Soil and Water Research Center was doing soil nourish. Tillage consisted of spring tillage (25-30 cm), The disk was to create a uniform surface. for prepare the land was used agricultural machinery. Experiment a two factor factorial in a randomized complete block design with three replications was conducted.. Factors studied in this experiment are as follows: Factor A: use of cover crops type of winter and spring in six levels (spring wheat, winter wheat, spring barley, winter barley, winter rye, winter rye, 50% +50% winter barley). Factor B: how management of cover crop (undercutting mulch, living mulch head cutting, a mulch with herbicide). It also includes two control (without cover crop and no weeding weeds, and without cover crop and total weeding weeds) That in the main experiment was conducted. At each stage of sampling, weed weeding was done now. Each block consisted of 20 experimental plots, the experimental plots with dimensions 2 × 5 m. Additional planting line as a border line between the plots were considered. Each plot consisted of four rows with the peppermint 40 cm distance between plants was considered. According to the map planting, cultivating between rows two lines, cover crops were planted. Seed value used to create the cover of the stack was 160 kg per hectare. in the 4 May seed of cover crop planted by hand. Using toothed harrow was mixed with soil. Peppermint of trans were planted in the 7 May. Most of the weed farm was pigweed, lambsquarter, wild mustard, salsola kali, convolvulus arvensis. Weed sampling and weeding total weeds was done in three stages (30, 60, 90) days after planting was peppermint and cover crop management practices were implemented before heading. Cover crop from a height of 20 cm above ground level was cutting, not to cause ghosting on herb plants .Create mulch with herbicide treatment, before heading (before the second stage of sampling) over the cover crops with herbicide Paraquat and Glyfosyt to 6 liters per hectare was used. before using herbicide on weed, peppermint plants were covered with plastic ,impact of herbicides on the plant will prevent. For Sampling of using quadrate 0.5 × 0.5 yards. Total weight and total weed dry weight was measured.. Number of branches, fresh weight leaves Peppermint, dry weight leaves Peppermint and fresh yield Peppermint was determined. analyze data after normalizing the data, were performed using SAS software and Excel software was used for drawing diagrams.

Results and Discussion

Number of branches of Peppermint

According to analysis of variance, simple effects of cover crop in the five percent level and how to manage the level of One percent of statistical significance on a number of branches of peppermint was achieved (Table 1). Comparison showed that the highest number of branches has created a winter wheat into compared with other levels of cover crop (winter barley, spring barley, rye, winter rye + winter barley, spring wheat). But in how to manage, mulch undercutting and mulch with herbicide has the largest number of branches. Control treatment without weed weeding minimum number of branches of peppermint, Due to fierce competition weeds were obtained with peppermint (Table 2).

Fresh weight leaves Peppermint

Fresh weight leaves Peppermint under the influence of the main effect of cover crop and how it was managed, but their interaction (type of cover crop and management their) means failed (Table 1). Also according to the comparison, winter wheat had the highest fresh weight leaves Peppermintand. Managerial levels (undercutting mulch, living mulch head cutting, a mulch with herbicide) to obtain the maximum amount of fresh leaves in simulated with without cover crop and total weeding weeds (Table 2).

Dry weight leaves Peppermint

According to the analysis of variance main effect of cover crop management on dry weight leaves peppermint were significant, but the interaction between these factors was not significant (Table 1). Most peppermint leaf dry weight by winter wheat and spring wheat was obtained. levels of management undercutting mulch in the same group with the control (no cover crop and weed weeding) were used, Most Leaf dry weight for themselves accounted. Samdani and Rahimian (2007) Stated that the weight of single plant was under the effect of different treatments. Revealed that the maximum weight of single plant as to tretment cover crop 100% hairy vetch and rye and mixture of 75% hairy vetch + 25%rye. They stated that seems to be the by increasing branching tomatoes caused have more fruit production And this leads to differences in the yield of these treatments with other treatments. (Table 2).

Peppermint yield

Table Analysis of variance showed that the main effect of cover crop management on the yeild peppermint achieved means, but the main effect of type of cover crop and interaction effect type of cover crop and management their was not significant (Table 1). Managerial levels (undercutting mulch, living mulch head cutting, a mulch with herbicide) to obtain the maximum amount of on yield Mint, and located in the same group with the control. (without cover crop and total weeding weeds) (Table 2). Some research on crops such as corn, yield reduction was observed after residues of rye, may be due to the adverse effects of allelopathic compounds on the product. Hall et at reported in 1984, Lack of mulch proper control in combination with corn, crop yields between 39-50 percent decreases. But when using herbicides , cover crop growth stoped, yield loss is reduced to 5 to 9%.. Kruidhof et al (2008) Announced they cover crop of winter crops Can reduce weed competition with the main crop in the second crop and may also reduce the soil seed bank of weeds. Jahedi (2003) also reported, Cover crops of rye, hairy vetch, canola and intercropping their, potato yield increased compared to control. He stated, Mixed treatment cropping rye, vetch, canola, rye, canola and rye monoculture compared with other treatments had the highest yield. Compared to control potato tuber yield of 42 percent.

fresh weight total of weed samples (I, II, III)

Analysis of variance (Table 3) showed a main effect of cover crop on sampling at the level five of statistical percent had statistical significant effect on the weight total weeds. While the main effect of type cover crop on the second and third stages of sampling wasn,t significant. But how manage cover crops in all three sampling, levels one percentage on a the total fresh weight of weed was significantly affected. (Table 4), all three cover crop management in the first stage sampling had the same effect on the total weight of weeds, and lowest total weed fresh weight compared to control (no weed cover crop weed-free) achieved. But in the second stage of the sampling minimal fresh weed mulch created with herbicide, But in the second stage of the sampling minimal weight total of weed obtain by mulch created with herbicide, that the control (no weeding weed and no cover crop) was the lowest. but in third stage of the sampling, head cutting living mulch and mulch created with herbicide compared to the control treatment (without weeding weed and no cover crop) total weigh weed was the lowest (Table 4). Percent the total fresh weight weed relative to control, by management undercutting mulch,head cutting living mulch and mulch created with herbicide in the first stage sampling was respectively 51.39, 45.68, 60.49%, in the second stage of sampling, 88.2, 91.65, 98.17% and in the third stage of sampling, 94.84, 96.62, 95.88% respectively. Comfort and Jerry (1996) also showed , that living mulch of rye for shoot weed biomass, respectively 90, 82 and 62% respectively in the years 1992, 1993, 1994, reduction compared to treated non-rye and weed. Ghaffari and colleagues (2011) also showed that living mulch, rye, barley and canola, triple-density, weed biomass, respectively, 97, 96, and 94% was lower than the control. Kruidhof et al (2008) also showed that living mulch, rye and canola, respectively, 98 to 92 percent decrease compared to the control treatment.

The dry weight total of weed samples (I, II, III)

Analysis of variance (Table 3) showed a main effect of cover crop on first stage sampling at the five percent had a significant effect on the dry weight total of weed. While the main effect of type cover crop on the second and third stages of sampling was significant. But how manage cover crops in all three stage sampling, in level one percentage the total dry weight of weed a was significantly affected. The interaction of how cover crop management weren,t significant in all three phases. In the first stage of the sampling, minimal total dry weight of weeds abtain to by winter rye and spring barley of cover crop, respectively. (Table 4), three cover crop management in the first and third stage sampling had the same effect on the total dry weight of weeds, And the lowest total weed dry weight compared to the control (no weed cover crop weed-free) achieved. In the second phase the sampling minimal of weed dry weight was by mulch with herbicide, that Compared to the control (no weed weed and vegetation cover) was the lowest. The total weight dry of controlled weeds by mulchundercutting management ,living mulch heading and mulch created with

herbicide first sample respectively 34.6, 32.15, 41.98%,in the second stage of sampling, 90.53, 92.39, and 96.79% in the third stage of sampling 94.03, 94.97, 94.52% respectively. Samdani et al (2005) reported that rye and wheat due to high biomass and ghosting, good weed controlled. compete of The barley with weeds better of wheat and was adapted with their environment, Because barley plant grows better. Another study by Creamer and Baldwin (2000) the treatments living mulch, rye and canola, respectively, 98%, 92% reduce biomass of weed. Jahedi (2003) also stated that, Despite the lack of use of herbicides , t Cover crop treatments to reduce the dry weight of weeds in potato were better than control.

Overall, this study showed that The proper management of cover crops had the greatest impact on yield, fresh weight, dry weight and yield peppermint. by three management the highest value of branches, fresh weight, dry weight and yield of peppermint relative to control (no cover crop and weed weed), and the lowest total fresh weight and dry weight of weeds was obtained. cover crop Winter wheat also the largest number of branches, fresh weight, dry weight and yield were obtained.

Table 1 - Analysis of variance of plant cover and how to manage the properties of peppermint

		Mean-square			
Sources	df	Number of branches	*leaves fresh* weight	leaf dry weight	yeild
Replication	2	5.38**	0.34**	0.24**	0.31**
Cover crop	5	0.99*	0.33*	0.04*	0.01^{ns}
management	4	29.52**	1.78**	1.42**	1.36**
Cover crop× management	20	0.49^{ns}	0.01^{ns}	0.01^{ns}	0.09^{ns}
Error	58	0.38	0.20	0.02	0.04
CV%	-	14.71	9.68	12.21	5.67

**,Highly significant at 1 % level of probability. *,Significant at 5 % level of probability. ns,Non significant

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Table 2 - Means comparison of effect of type cover crop and how to manage on *number of branches*, *leaves fresh* weight, *leaf dry weight*, yeild peppermint

Sources of variance	*Number of branches*	*leaves fresh* weight	*leaf dry weight*	yeild
winter wheat	24a	62.94a	35.68a	-
spring wheat	19b	54.96ab	36.73a	-
winter barley	18b	44.43b	27.48ab	-
spring barley	16b	42.85b	25.17b	-
winter rye	19b	49.35ab	29.84ab	-
winter rye50% +50% winter barley	19b	47.1b	28ab	-
mulch undercutting	25a	63.71a	40.47a	63.75a
living mulch head cutting	20b	55.56a	32.3ab	67.87a
mulch with herbicide	25a	57.33a	30.1b	53.98a
control without cover crop and no weeding weeds	4c	13.47b	9.48c	16.18b
control without cover crop and total weeding weeds	22ab	61.28a	39.07a	55.16a

Means in each column with same letters are not different significantly

Table 3 - Analysis of variance of type cover crop and how to manage on the *fresh weight total and dry weight total weeds*

		Means square					
		fresh weight total			*dry weight total*		
Sources of variance	df	sampling *I*	sampling *II*	sampling *III*	sampling *I*	sampling *II*	sampling *III*
Replication	2	0.002^{ns}	0.004^{ns}	0.02**	0.001^{ns}	9815.77**	3467.93**
Cover crop	5	0.006*	0.02^{ns}	0.008^{ns}	52.77*	432.9^{ns}	77.9^{ns}
management	4	2.84**	3.67**	3.52**	3745.36**	22790.549**	923592.76**
Cover crop× management	20	0.002^{ns}	0.017^{ns}	0.003^{ns}	22.04^{ns}	290.533^{ns}	34.12^{ns}
Error	58	0.003	0.016	0.003	26.13	1024.86	549.62
CV (%)	-	3.89	9.08	4.38	22.06	28.25	19.06

**,Highly significant at 1 % level of probability. *,Significant at 5 % level of probability. ns,Non significant

Table 4- Means comparison of effect of type cover crop and how to manage on the *fresh weight total and dry weight total weeds*

	fresh weight total			*dry weight total*		
Sources of variance	sampling *I*	sampling *II*	sampling *III*	sampling *I*	sampling *II*	sampling *III*
winter wheat	225.6ab	-	-	48ab	-	-
spring wheat	206.42ab	-	-	47.9ab	-	-
winter barley	186.2ab	-	-	44.62ab	-	-
spring barley	177.78ab	-	-	43.02b	-	-
winter rye	165.82b	-	-	42.22b	-	-
winter rye50% +50% winter barley	239.9a	-	-	52.2a	-	-
mulch undercutting	200.86b	355.14b	171.12b	51.92b	89.04b	63.6b
living mulch head cutting	224.14b	251.52b	112.4bc	53.46b	71.52bc	53.08b
mulch with herbicide	163.2b	54.88c	136.9bc	23.38b	31.16cd	57.76b
control without cover crop and no weeding weeds	413.24a	3013.24a	3330.66a	79.5a	940.86a	1055.04a
control without cover crop and total weeding weeds	0c	0c	0c	0c	0c	0c

Means in each column with same letters are not different significantly.

Resources

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