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The effect of barley grass cover crop on control weed of flix weld (*Descurainia Sophia)*

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ABSTRACT

Today, planting winter cover crops to reduce herbicide is high considered. The purpose of this study was to examine the effect of barley grass cover crop on control weed of flix weld (Descurainia Sophia). This experiment was conducted at agricultural farm of Rezvan Junior College in kerman provinces (latitude 25° 55 ′ N, longitude 53° 26 ′ E , altitude 1755m) from September 2010 to April 2011. A completely block randomized design experiment was performed with three replications. The treatments involved: control (without cover crop) and barley grass cover crop with three aggregation respectively. After land preparation operations include plowing, disking and leveling, cover crop plants were implanted on 12 September 2010. The seed of cover crop plants was strew by hand in two directions perpendicular to the surface of soil and then uniformly spread and mixed through with a toothed harrow. In the medium of May 2011 randomly sampling were doing for investigate the effect of cover crops on biomass, density and diversity of natural populations of winter weed and also biomass production plants. The results of this experiment showed that the experimental treatment were reduce weed of Descurainia Sophia compared with control. Treatments 1 and 2 during the growing season had the highest weed control. Both treatments were decreased the average of weed density compared with control (30 and 31% respectively). Treatments 1 and 2 were also product higher yield of the barley compared with control group (58 and 45 % respectively). These treatments were increased average weight of the barley 60 and 27% compared with control. The results of the current study suggested that the planting winter cover crops have a beneficial effect on control ans suppress of weed.

Key words: Barley grass, Cover crop, Performance, Weed, Flix weld

INTRODUCTION

The use of cover crops in conservation tillage offers many advantages, one of which is weed through physical as well as chemical [33, 37].Most of the benefits of cover crops are well known. They provide wind and water erosion control, conserve soil moisture by reducing evaporation and increasing infiltration, increase the content of organic matter, increase fertility by recycling nutrients, add nitrogen (N) if they are legumes, and improve soil structure. Certain cover crops can also improve weed control by increasing mulch and allelopathically suppressing weed growth and may improve environmental quality, especially through the protection of surface water and groundwater, by reducing or in some cases eliminating the need for preemergence herbicides. The presence of crop residues has been reported to both increase and decrease crop yields [27]. No-till has been reported to increase the presence of certain difficult to control weeds [27]. However, other reports indicate that the presence of certain mulches can reduce the biomass of weeds and allow for higher crop yields [7, 38, 60]. Research to date indicates that both mulch and the lack of soil tillage contributes to the suppression of weeds in no-till cropping systems [13]. Planting cover crops to simultaneously establish native prairie seedlings and prevent weed invasion is an increasingly common management practice. The idea is based on the assumptions that the cover plant will act as a nurse plant to prairie seedlings and that it will have a positive effect on seedling recruitment by suppressing weeds and by lowering the harmful effects of high evaporation and light availability. Cover crops could also potentially reduce the amount of soil erosion that occurs during planting. However, the evidence supporting the benefits of cover crops is mostly anecdotal and has been challenged. Clearly, there is a need for further scientific evidence on the efficacy of cover plants, their possible facilitative or competitive effects on prairie seedlings, as well as how these processes work. Of particular interest is whether the nurse plant effect is caused by light suppression or water uptake. The term cover crops will be used in this chapter as a general term to encompass a wide range of plants that are grown for various ecological benefits other than as a cash crop. They may be grown in rotations during periods when cash crops are not grown, or they may grow simultaneously during part or all of a cash-cropping season. Various terms such as green manure, smother crop, living mulch and catch crop refer to specific uses of cover crops. Cover crops have multiple influences on the agroecosystem [52, 46]. They intercept incoming radiation, thereby affecting the temperature environment and biological activity at various trophic levels in the leaf canopy and underlying soils. They fix carbon and capture nutrients, thereby changing the dynamics and availability of nutrients. They reduce rain droplet energy and influence the overall distribution of moisture in the soil profile. They influence the movement of soils, nutrients and agrochemicals into and away from agricultural fields. They can change the dynamics of weeds, pests and pathogens as well as of beneficial organisms. Thus, the introduction of cover crops into the agroecosystem offers opportunities for managing many aspects of the system simultaneously. However, cover cropping also adds a higher level of complexity and potential interactions that may be more dificult to predict and manage. Cover crops have long been used to reduce soil erosion and water runoff, and improve water infiltration, soil moisture retention, soil tilth, organic carbon, and nitrogen [30, 45, 53, 57, 61]. Cover crops have been used to manage weeds in several crops, including corn (Zea mays L.) [23, 59, 61], cotton (Gossypium hirsutum L.) [57, 59], soybean [6, 28, 32], and southern pea (Vigna unguiculata (L.) Walp) [10]. Weed suppression by cover crop residue is attributed to both physical and chemical interference. Rye is a commonly used cover crop that reduces density and biomass of several weed species in soybean [28, 32] and corn [55]. Other annual grass species such as oat, Italian ryegrass, and wheat [10, 32, 58], and annual legume species such as crimson clover, hairy vetch, and subterranean clover [55, 54, 59, 61] have been investigated for potential weed control benefits. In addition to benefits provided by cereal cover crops, legume cover crops biologically fix atmospheric nitrogen that subsequently becomes available during residue decomposition [45, 57]. Descurainia sophia is a winter annual that reproduces by seeds from early to late summer [44]. It is one of the first weedy species to appear each spring [13] and is early blooming [12]. Seeds germinate in its largest numbers in the fall and form rosettes, with plants overwintering, surviving freezing conditions and drying winds, and resumes growth in the spring [8, 43, 47]. Although, it is reported that more germination may occur in the spring [47] in some areas. In the early spring the plant rapidly develops numerous leaves and lateral branches [8] producing as many as 15 lateral branches [25, 8]. Plants flower between March and July depending on geographic location [12], producing large quantities of seed that mature early [47]. Descurainia sophia plants are said to require vernalization (cold temperatures) for flowering [26]; seeds stored for 8 months at room temperature without natural vernalization and sown outdoors in early May, required 95 days to flower, versus seed overwintered in the soil and spring-emerging which flowered in 45 days. Descurainia sophia produces large numbers of seeds. The capacity of the plant to produce numerous lateral branches when conditions are favorable and subsequently, inflorescences, enables a prolific production of seeds [8]. Flixweed seed is very small and dark yellow or brown bearing an uneven surface in a stretched oval form, one end of which is cut and maintains a transparent yellowish ring [3, 17]. Flixweed is native to southern Europe, Asia, South Africa, South America and New Zealand [17]. With regard to its propagation, flixweed wildly grows in the west, north (Amol), center (Tehran, Karaj, Yazd), and south of Iran (Kerman, Fars) in non-agronomical and fairly humid regions [1, 18]. Studies indicate that consumption of flixweed in women during pregnancy leads to more successful deliveries and less instances of elongated insemination, delivery and pregnancy [20]. Flixweed seeds are used in China as laxative and antipyretic, and for the alleviation of skin inflammations such as hives. Flowers and leaves of flixweed are utilized as astringent as well as obviator of vitamin C deficiency. Flixweed seeds are also used for the excretion of ascarid and renal calculus. According to the Iranian traditional medicine, flixweed is of a warm and moist nature and bears properties such as stomach strengthening, alleviating of hoarseness, lightening complexion, as well as appetizer and as a treatment for measles and scarlatina [31, 17]. Boiled flixweed is also used as treatment for chronic bronchitis, excretion of chest mucous and treatment of diarrhea [4, 18]. Cover crops can reduce weeds in subsequent cash crops. While the cover crop is growing, it can suppress the germination and growth of some early spring weeds through competition and shading [56]. Cover crop residues remaining on the soil surface can physically modify conditions for seed germination by altering the seed environment (through changes in light availability, soil temperature, and soil moisture) and through other types of interference, primarily allelopathy [16]. After cover crop dessication, it is important to prevent soil disturbance to maintain maximum soil cover from cover crop residues [10]. Therefore, the aim of this study was to investigate the effect of barley grass cover crop on control weed of flix weld (Descurainia Sophia).

MATERIALS AND METHODS

This experiment was conducted at agricultural farm of Rezvan Junior College in kerman provinces (latitude 25° 55 ′ N, longitude 53° 26 ′ E , altitude 1755m) from September 2010 to April 2011. A completely block randomized design experiment was performed with three replications. The treatments involved: control (without cover crop) and barley grass cover crop with three aggregation respectively. After land preparation operations include plowing, disking and leveling, cover crop plants were implanted on 12 September 2010. In the present study plot size was 5 x 4 meters. The seed of cover crop plants was strew by hand in two directions perpendicular to the surface of soil and then uniformly spread and mixed through with a toothed harrow. In the medium of May 2011 randomly sampling were doing for investigate the effect of cover crops on biomass, density and diversity of natural populations of winter weed and also biomass production plants. From each plot four quadrant 50 * 50 m randomly picked and weeds and cover crops was separated. In addition, density and diversity of natural population weed was determinated. All samples were dried at 70 ° C for 48 hours and then were weighed. To determine the yield and yield components in the two central rows of each plot 4 square meters was picked and the number and size of clusters was determined. Also amount weed of Descurainia Sophia were evaluated.

Statistical Analysis

Data were analyzed by ANOVA using General Linear Models procedure of SAS software. Means were compared using Tukey test. Level of significance used in all results was 0.05. Least square treatment means were compared if a significant F statistic (5% level of P) was detected by analysis of variance. A probability value of $P \leq 0.05$ indicated that the difference was statistically significant.

RESULTS AND DISCUSSION

Results of cover crop dry matter production are presented in Table 1. Cover plants showed a significant difference for dry matter production. Experimental treatment were production dry matter 1135/4, 998/6, 756/ 33 g/ m^2 respectively. The difference between treatments was significant. The results of this study showed that the weeds was reduced with increased density of barley cover crop. Cover crops can reduce weeds in subsequent cash crops.While the cover crop is growing, it can suppress the germination and growth of some early spring weeds through competition and shading [54]. Cover crop residues remaining on the soil surface can physically modify conditions for seed germination by altering the seed environment (through changes in light availability, soil temperature, and soil moisture) and through other types of interference, primarily allelopathy [16]. After cover crop dessication, it is important to prevent soil disturbance to maintain maximum soil cover from cover crop residues [11]. Smeda and Weller [50] found that cereal rye biomass suppressed most common annual broadleaf and grassy weeds for 4 to 8 weeks after the rye was killed. Thus, use of a rye cover crop could provide a system that eliminates the need for a soil-applied herbicide at transplanting without depressing yield. However, the authors indicated that post-emergence weed control of escaped weeds may be necessary in some years.

Table 1 : Analysis of variance for cover crop dry matter production

Source	DF	Sum of Squares	Mean Squares
Repeat	2	37219/62	12404/56
Treat	3	501497/61	167146/54
Exprimental Error	6	40603/93	6765/23

Results of dry matter and natural population density of weeds winter are presented in Table 2. Winter cover crops weed density in sampling time were significantly affected by treatments. Three density cover crop of barely were reduce weed winter density compared with the control (41, 50, 63 respectively). Cover crop residues remaining on the soil surface can physically modify seed germination by altering the seed environment (changes in light availability, soil temperatures, and soil moistures) and through other types of interference, primarily allelopathy. Allelopathy has been defined as "any direct or indirect harmful effect produced in one plant through toxic chemicals released into the environment by another" [40]. Most studies of allelochemical weed suppression have been conducted in laboratories, greenhouses, or growth chambers. Many researchers acknowledge that the quantity of allelochemicals produced and the suppression observed under these conditions may not occur under field conditions. The effects of microorganisms, plant stress, weather, insect herbivory, growth stage, soil nutrient levels, etc.may all have a role in allelochemical production [19], and these influences may be lost or modified in a controlled environment. Generally, cover crop selection is based on individual enterprise or production goals. For example, if the purpose of a cover is to provide readily available, biologically fixed N for subsequent crops, then the grower should choose a legume such as hairy vetch or cowpea. If the cover crop will be managed as a surface mulch for weed suppression or incorporated to improve soil quality, then the grower should choose a grass cover crop such as cereal rye or sorghum-sudangrass. Both of these grass cover crops can produce large amounts of biomass with high C:N ratios at maturity, and both are reported to suppress (some) weeds. Winter cover can be established by interseeding forage legumes and grasses in corn early in the growing season (at cultivation). Like traditional cover crops, interseedings reduce erosion and add organic matter to the soil. Interseeded legumes can also contribute nitrogen (N) to the cropping system [48].

Table 2 : Analysis of variance for dry matter and natural population density of weeds winter

		Mean Squares	
Source	**DF**	**Dry weight of weeds winter**	**Density of weeds winter**
Repeat	2	569/6	1964/4
Treat	3	261630/7	9278/8
Error	6	4079/1	883/1

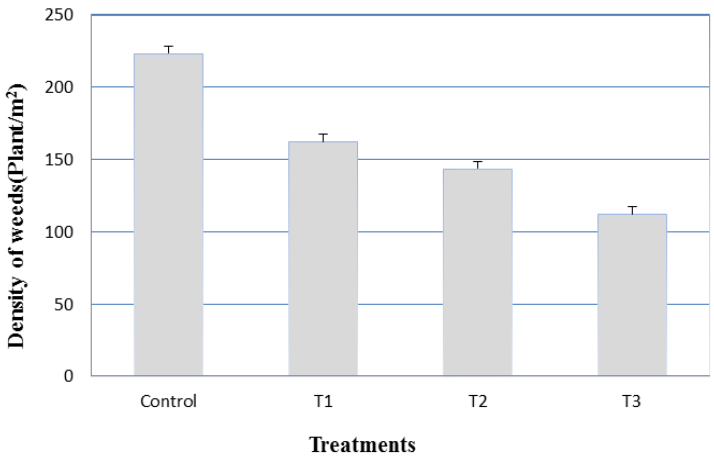

Figure 1: Experimental treatment means of density weeds winter

Results of density weeds winter are presented in Figure 1. Treatment 3 and 4 had lowest dry weed weight at this stage. Cover plants, 15 days after vegetate were significantly reduce dry weight weed. In organic systems, cover crops may be destroyed by tillage, mowing, undercutting, or rolling. In a wet growing season, incorporating legumes may produce the highest yields. However, under relatively dry growing conditions, legume residue left on the surface helps conserve soil moisture and yields are higher with conservation tillage. In no-till organic production systems, cover crops are normally killed mechanically and left on the surface as a mulch. Of the three methods for mechanically killing cover crops, undercutting, mowing, and rolling, the first is the most effective. An undercutting implement utilizes a steel bar that is drawn several inches underneath the soil surface (usually beneath a plant bed), severing the top growth and crown of the plant from the roots, and leaving the surface and aboveground biomass undisturbed. Mowing with a flail mower leaves the finely chopped residue evenly distributed over the bed, and, unless packed well, the residue tends to decompose quickly. Rolling the cover crop damages the plants by lodging them severely and by successive crimping of cover crop stems. Rolling keeps the above ground part of the plant attached to the root system. Rolled plants decompose more slowly than those killed by mowing and, consequently, control weeds for a longer period of time [29]. The procedures for planting without tillage into a cover crop are similar to those used when planting into residues of a previous crop such as soybeans or corn. Please refer to the chapter, "Tillage in Organic Farming Systems" for more information about managing cover crop biomass.

Research investigating the profitability of cover crops in horticultural systems is still in the beginning stages. Many more years of data are required to evaluate the long-term profitability of cover crops in horticultural systems. Increased profitability from use of cover crops is generally attributed to a reduction of inputs such as N fertilizer, herbicides, reduced costs of pest and disease control, and reduced tillage operations. A review of work recently completed suggests that reducing input costs with cover crops may not be enough to increase profitability, and that it appears that crop yields must also be enhanced [29]. In two studies where cover crops were found to be unprofitable, crop yields for the cover crop systems were lower than those for the conventional systems [15, 9]. In studies where cover crops were found to be more profitable than conventional systems, reduced input costs were accompanied by enhanced yields [34, 24]. Results of dry matter and density of weeds are presented in Table 3.

Table 3 : Analysis of variance for dry matter and density of weeds

		Mean Squares							
		Dry weight of weeds				Density of weeds			
Source	DF	Stage 1	Stage 2	Stage 3	Means	Stage 1	Stage 2	Stage 3	Means
Repeat	2	232/2	318/0	19682/27	1967/53	13/14	6/60	13/27	2/97
Treat	3	1099/61**	7971/88**	36822/6**	9766/44**	50/68*	46/11**	98/73**	56/72**
Error	6	113/6	700/4	2484/05	252/16	16/26	4/05	7/94	3/05

** Significant in level (0.05). ** Significant in level (0.01).*

Cover crops can attract both beneficial and harmful insects into cropping systems [2, 5]. Both can disperse to cash crops when the cover crop matures or dies, and effects on insect populations will depend on the cover crop, the subsequent cash crop, and other environmental factors [15]. For example, a rye cover in a tomato (Lycopersicum esculentum) production system decreased fruitworm (Helicoverpa zea) damage, but increased stinkbug (Acrosternum hilare) damage [41]. Prior to the arrival of important insect pests of vegetable crops, beneficial insects can be attracted into an area by the moisture, shelter, pollen, honeydew, nectar, and insect prey associated with a cover crop. They may subsist in the cover crop until the arrival of key pests and then move over into the vegetable crop to attack the pests. Cover crop biomass and N accumulation depend on the length of the growing season, local climate, and soil conditions [49]. For individual species, the variation in the proportion of total plant N derived from N fixation can vary widely and has been found to be dependent upon water supply, inoculation, crop rotation, tillage, applications of fertilizer N, and soil fertility factors such as P availability and soil pH [36]. Therefore, the proportion of total plant N derived from residual soil N (or fertilizer N) can vary widely as well, and would depend on these same factors. Generally, cover crop selection is based on individual enterprise or production goals. For example, if the purpose of a cover is to provide readily available, biologically fixed N for subsequent crops, then the grower should choose a legume such as hairy vetch or cowpea. If the cover crop will be managed as a surface mulch for weed suppression or incorporated to improve soil quality, then the grower should choose a grass cover crop such as cereal rye or sorghum-sudangrass. Both of these grass cover crops can produce large amounts of biomass with high C:N ratios at maturity, and both are reported to suppress (some) weeds. Mixtures of cover crop species can be planted to optimize the benefits associated with cover crop use. Grass species establish ground cover more quickly than legume monocultures, and roots are more physiologically active in autumn [39]. Mixtures that include grasses can therefore more effectively prevent soil erosion and reduce soil N concentration. Competition for soil N in mixed stands can also result in increased biological N fixation by the legume. Grass and legume species grown in biculture generally result in greater dry matter yields per unit area than the respective monocultures [42, 22, 51]. Aboveground cover crop biomass N content can be increased with a mixture that is spatially more efficient in utilization of nutrients and water [21, 35]. For example, a deep-rooted cover crop that is grown with a shallow rooted cover crop can utilize water and resources throughout more of the soil profile. A greater leaf area is exposed to sunlight, increasing photosynthetic efficiency. Planting mixtures of cover crops can take advantage of the allelopathic potential of the cover crops to suppress weeds. Allelopathic suppression of weeds has been shown to be a species specific phenomenon, therefore a broader spectrum of weed control may be possible by growing a mixture of cover crop species, each contributing allelopathic activity towards specific weed species [14]. Mixtures can also be planted to influence insect populations. Cover crop species, regardless of biomass or biomass N production potential, could be included a mixture if they were known to attract important beneficial insects into the cropping system.

CONCLUSION

Many researchers have found that use of certain cover crops suppresses weeds to the extent that herbicides are not needed. This would result in a substantial reduction of environmental contamination potential, especially for ground water supplies.With the other well-known benefits of cover crops that can benefit the environment, such as wind and water erosion control, nutrient recycling, this new potential will continue to help make our water clean and keep it clean. In conclusion, experimental treatment were reduce weed biomass compared with control. Thus, it can be said that this species prevented weed establishment.

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