International Journal of Bioresource Science
Citation: IJBS: **12**(01): 15-25, June 2025
DOI: 10.30954/2347-9655.01.2025.2

ASSOCIATION FOR AGRICULTURE ENVIRONMENT AND BIOTECHNOLOGY

RESEARCH PAPER

Judicious Use of Weed-suppressive Living Mulches Reduces not only Reliance on Herbicides but also Optimizes Potato Yield

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Received: 14-03-2025 **Revised:** 09-05-2025 **Accepted:** 30-05-2025

ABSTRACT

The study was conducted at Mohaghegh Ardabili University during the 2022 and 2023 rain seasons to evaluate the effectiveness of different potato cultivars and cover crop mulches in managing weeds. The experiment was structured as a split plot with three replications, featuring three potato varieties: Agria, Jely, and Lady Rosetta. The weed management strategies included rye (*Secale cereal* L.), Berseem clover (*Trifolium alexandrinum* L.), paraquat herbicide, a weed-free control, and a weedy check. Results indicated that the Lady Rosetta cultivar combined with rye cover crop provided the best weed control, resulting in a total weed density of 22.5 plants/m² and a dry weight of 225.33 g/m², alongside a potato tuber yield of 71.4 t/ha. In contrast, the Jely cultivar paired with paraquat herbicide exhibited the weakest performance, with a total weed density of 49.66 plants/m², a dry weight of 605.33 g/m², and a yield of 37.6 t/ha. Notably, the highest density and dry weight of problematic weeds, such as pigweed (*Amaranthus retroflexus* L.), were observed in the Jely × weedy check treatment. Analysis of variance revealed significant effects of the treatments on plant height, tuber greening percentage, average tuber weight per plant, tuber number, and overall yield. The interaction between cultivar and management practices showed that, excluding the weed-free treatment, the Lady Rosetta × Rye combination resulted in superior plant height, soil coverage percentage, tuber weight, and number compared to other treatments.

HIGHLIGHTS

- The study evaluated the effectiveness of different potato cultivars and cover crop mulches in managing weeds.
- Lady Rosetta cultivar combined with rye cover crop provided the best weed control while Jely cultivar paired with paraquat herbicide exhibited the weakest performance.
- The highest density and dry weight of problematic weeds were observed in the Jely × weedy check treatments.

How to cite this article: Ahmadi, M., Fakhari, R., Nungula, E.Z., Maitra, S. and Gitari, H. (2025). Judicious Use of Weed-suppressive Living Mulches Reduces not only Reliance on Herbicides but also Optimizes Potato Yield. *Int. J. Bioresource Sci.*, **12**(01): 15-25.

Source of Support: IUCEA; **Conflict of Interest:** None

- The Lady Rosetta × Rye combination resulted in superior plant height, soil coverage percentage, tuber weight, and number compared to other treatments.

Keywords: Agria, Berseem clover, Paraquat herbicide, Sustainable agriculture

Potatoes are a crucial agricultural product, ranking alongside wheat and rice as one of the primary sources of human nutrition. They yield more weight and calories per unit area compared to other crops, making them an efficient food source (Biswas *et al.* 2017; Shao *et al.* 2023; Ireri *et al.* 2019). Nutritionally, potatoes are rich in starch, carbohydrates, vitamins (notably C and B), minerals, protein, and fiber, which positions them as an affordable energy source for many diets. In Iran, the average per capita potato consumption is approximately 45 kg per year, significantly lower than the global average of 80 to 120 kg. Given the projected population growth to 7.9 billion by 2050, enhancing agricultural management practices is essential to increase potato production (Singh *et al.* 2013).

Weeds pose a significant challenge to potato cultivation, causing estimated damage ranging from 10% to 80% in fields (Biswas *et al.* 2017; Alhammad *et al.* 2023; Sow *et al.* 2024). This challenge necessitates row planting to allow adequate space for weed growth, particularly during the early stages of crop development (Amini *et al.* 2016). The dynamic nature of weed flora is influenced by ecological succession, requiring effective management strategies to mitigate their impact on crop growth and yield (Aynehband *et al.* 2019). Although weeds are a natural part of agricultural ecosystems, their control is vital due to their competitive effects on crops (Sahoo *et al.* 2024). Understanding the phenological characteristics of weeds and implementing timely management practices is fundamental in reducing their density and minimizing their adverse effects on potato production (Aynehband *et al.* 2019). Effective weed management not only enhances crop yields but also contributes to sustainable agricultural practices, which are necessary for food security (Ahmadi *et al.* 2019; Ray *et al.* 2024).

Inorganic pesticides among other synthetic chemicals that are used in agriculture pose significant risks to human and animal health, contribute to environmental pollution, and lead to the development of weed resistance (Uchino *et al.* 2009; Pedda Ghouse Peera *et al.*, 2020; Sairam *et al.* 2023; Ngaiza *et al.* 2025). Consequently, it is essential to explore non-chemical methods for weed management. Strategies such as using suppressive cultivars, cover crops, mixed cultivation, appropriate planting patterns, tillage systems, identifying critical periods for weed control, and crop rotation are effective non-chemical approaches (Kakaeian *et al.* 2015). Relying solely on any single method will not yield satisfactory weed control; instead, an integrated approach is necessary (Ramos *et al.* 2010). Cover crops play a vital role in sustainable agriculture by offering numerous benefits, including nutrient distribution and reabsorption, particularly of nitrates, enhancing soil organic matter, preventing soil erosion from water and wind, providing habitats for beneficial insects, suppressing weeds, and ultimately increasing crop yields (Uchino *et al.* 2009; Nasar *et al.* 2022, 2024; Kakaeian *et al.* 2015). Leguminous cover crops can reduce weed competition for light and nutrients while lowering the carbon-to-nitrogen ratio, which contributes to higher yields (Harun *et al.* 2016; Krishna *et al.* 2024). Additionally, the secretion of allelopathic substances from living mulches can further inhibit weed growth (Blanco-Canqui *et al.* 2013).

One of the main challenges in utilizing cover crops is selecting the appropriate species for effective weed suppression (Blanco-Canqudadai *et al.* 20150. Research comparing the effects of rye, rapeseed, and barley as cover crops has shown that rye exhibits superior inhibitory effects on weed density (Campiglia *et al.* 2010). Experiments have demonstrated that cover crops significantly enhance potato tuber yields compared to weedy controls (Gitari *et al.* 2017). For instance, planting rye as a cover crop alongside corn has proven to be highly effective in boosting corn yields (Altieri *et al.* 2011; Ghaffari *et al.* 2012). Furthermore, incorporating soybean cover crops into corn cultivation has been shown to significantly reduce weed density (Dadashi *et al.* 2015; Schmidt *et al.* 2018). Despite these advantages, research on the effectiveness of plant mulches for weed control in Iran remains limited. This study aims to identify suitable, environmentally friendly methods for effectively managing weeds in potato cultivation.

MATERIALS AND METHODS

Study Area

Two experiments were conducted at the Agricultural and Natural Resources Research Center of Mohaghegh Ardabili University during the 2021-2022 and 2022-2023 growing seasons (Fig. 1). The experimental design was a split plot arranged in a randomized complete block design with three replications. The main plots consisted of three potato varieties: Agria, Jely, and Lady Rosetta. The subplots focused on various weed management strategies, including rye (*Secale cereal* L.), berseem clover (*Trifolium alexandrinum*), paraquat herbicide, and a weed-free control (no weed control) (Fig. 2). To assess the soil conditions of the experimental field in terms of its physical and chemical properties, soil samples were randomly collected from a depth of 0 to 30 cm. These samples were analyzed in the soil science laboratory, and the results are presented in Table 1. Details regarding the characteristics of the three cultivars, Agria, Jelly, and Lady Rosetta, are given in Table 2.

The species composition of the dominant broadleaf weeds in the potato field in the test areas is shown in Table 3. The experimental design is also depicted in Fig. 2.

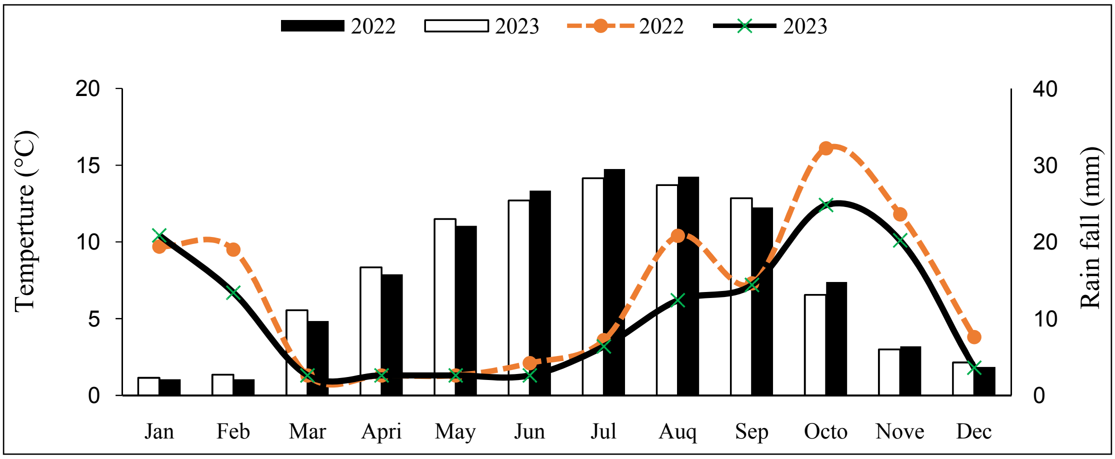

Fig. 1: Climate conditions (temperature and precipitation) during the growing season of 2022 and 2023

Table 1: Physical and chemical soil analysis of the field

Texture	Sand (%)	Silt (%)	Clay (%)	K (ppm)	P (ppm)	N (%)	OC (%)	pH	EC (ds/m)	Depth (cm)
SC	14	40	46	626.6	12.72	0.12	1.2	7.9	1.08	0-30

SC = Sandy Clay, K= Potassium, P= Phosphorous, N= Nitrogen, OC= Organic Carbon, EC= Electrical Conductivity

Table 2: Details on the characteristics of three Agria, Jely, and Lady Rosetta cultivars

Lady Rosetta	Jely	Agria	Characteristics
Half late	Half late	Half late	Growth period
Round	Oval	Elongated oval	Tuber shape
Medium to large	Medium to large	Quite big	Tuber size
Shallow with few numbers	Shallow	Shallow	Superficial bud
Light yellow	Light yellow	Yellow	Skin color
Light yellow	Light yellow	Yellow	Flesh color
Top	Top	Rather top	Yield
Very good	Good	Good	Storage capability
Stiff	Almost stiff	Almost stiff	Glandular tissue
Too high	Rather high	Rather high	Dry matter

Table 3: Spectrum of weeds in the test area

Species name	Scientific name	Family	Life-cycle	Photosynthetic cycle
Common amaranth	*Amaranthus retroflexus* L.	Amaranthaceae	Annual	C4
Fat hen	*Chenopodium album* L.	Chenopodiaceae	Annual	C3
Field bindweed	*Convolvulus arvensis* L.	Convolvulaceae	Perennial	C3

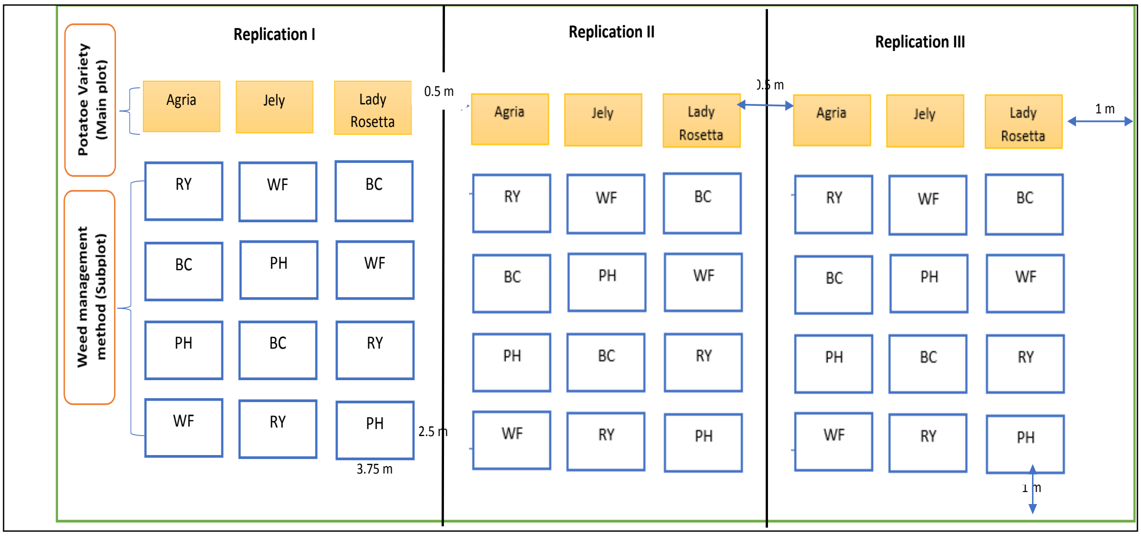

Fig. 2: Experimental layout. RY = Rye (*Secale cereal* L.); BC = Berseem clover (*Trifolium alexandrinum*); PH = Paraquat herbicide; WF = Weed free (no weed control)

Field Management

To prepare the planting beds, deep autumn plowing was carried out using a reversible plow to a depth of 50 cm during the experimental years. Following favorable environmental conditions in the spring, secondary tillage operations, including disking and soil preparation, were completed promptly. Each plot measured 2.5 × 3.75 m and contained five rows of potatoes, with a row spacing of 75 cm and a plant spacing of 25 cm. The first hilling occurred 20 days after planting, followed by a second hilling 34 days after planting, coinciding with the emergence of approximately 80% of the potato seeds. Rye and clover seeds were sown at rates of 300 kg/ha and 20 kg/ha, respectively, during the second tillage. The paraquat herbicide treatment was applied 29 days after planting, just before potato emergence, to avoid damaging the crop. An inter-model backpack sprayer equipped with an 8001-fan nozzle was used for herbicide application, ensuring consistent spraying speed and pressure across all treatments, calibrated to a rate of 400 L/m^2.

Irrigation began one month after planting and ceased one month before harvest. To manage pests, acetamiprid was applied at a rate of 250 g/m^2 upon the appearance of the Colorado potato beetle, while copper oxychloride fungicide was used at a rate of 1 kg/ha to combat potato blight. Approximately three weeks after treatment application, weed sampling was conducted using sampling units measuring 0.50 × 0.75 m^2. The samples were collected in envelopes and transported to the laboratory for analysis. After counting the number of plants by species, they were dried in an oven at 72°C for 48 hours to determine dry weight.

To measure plant height, six randomly selected plants from each plot were measured from the soil surface to the tip of the tallest main stem using a meter stick, and average heights were calculated. During the vegetative growth phase, three sampling areas of 3 m^2 (50 × 60 cm) were randomly placed in each plot to visually estimate and calculate average plant cover percentage. At the end of the growth period, tuber yield and its components were assessed by manually harvesting the produce from the two middle rows of each plot. The harvested tubers were transported in paper envelopes to the laboratory, where they were cleaned of soil and debris before being counted and weighed on a digital scale with a capacity of 2000 g and accuracy of 0.01 g. Tuber size was measured using calipers for averaging.

Data Analysis

Data analysis was performed using SAS version 9.1 software, with mean comparisons conducted using the LSD test at a significance level of 5%.

RESULTS AND DISCUSSION

Potato plant height

Based on the results, the main effect of cultivar, the main effect of management, and the interaction effects of cultivar × management on potato height at the stages of 30 and 60 days after planting were significant (Table 4). The results of comparing the mean interaction effects of cultivar and management on the height of potato cultivars indicate that the Lady Rosetta cultivar had significant differences with other treatments in different managements. The highest plant height was 283.83 mm and 280.33 mm in 30 days after planting for Lady Rosetta × weed free and Lady Rosetta × rye, respectively, and 510.33 mm and 495.67 mm for Lady Rosetta × weed free treatment and Lady Rosetta × Clover in 60 days after planting. The shortest potato plants were observed in the first height measurement for Jely cultivar × weedy check with 185.50 mm and in the second measurement for Jely cultivar x clover with 378 mm. In the first measurement, there was no significant difference between different weed management treatments for any of the cultivars, and it seems that there was not much competition between weeds and potatoes at these stages. However, in the second measurement, the study reveals significant differences and shows that the weeds have competed with the crops. In the present study, Lady Rosetta cultivar germinated faster than Jely and Agria, and had higher height and final height increase rate, and was able to reduce weed density and dry weight better than the Jely cultivar. Also, Lady Rosetta cultivar is genetically high. Based on the results of a report, it was determined that potato cultivars that have a higher initial growth rate and denser canopy are less affected by weeds and have more competitive ability than other cultivars (Hutchinson *et al.* 2011).

Percentage of potato cover

The results showed that there was a significant difference in the main effect of cultivar, the main effect of management, and the interaction effects of cultivar × management for the trait percentage of potato plant cover (Table 4). Comparison of the mean interaction effects of cultivar and management on the coverage percentage of potato cultivars showed that, regardless of the weed-free treatment, the highest coverage percentage was obtained for Lady Rosetta × rye cultivar (Table 5). The lowest percentage of canopy coverage was observed in the second stage for the Jely cultivar in different managements. The reason for the higher coverage percentage in the Lady Rosetta cultivar in the first stage was its rapid germination, which caused the Lady Rosetta cultivar to take the competitive space from the weeds by quickly closing the canopy, and finally showed a higher yield than other treatments. The low coverage percentage in Jely cultivar was due to low growth speed, low height, and smaller leaves compared to Agria and Lady Rosetta cultivars. In an experiment, the difference in yield in the conditions of no competition and competition with weeds in potato cultivars varied between 0.2 and 13.3 t/ha^2, and the researchers reported that the reason for this difference could be due to the differences in the morphological traits of the cultivars and their effect on reducing density and dry weight weeds or tolerance (Altamas *et al.* 2018).

Weed density

The results of analysis of variance showed that the effect of different treatments on the density of weeds of pigweed (*Amaranthus retroflexus* L.), common lambsquarters (*Chenopodium album* L.), and field bindweed (*Convolvulus arvensis* L.), and the density of total weeds was significant (Table 4). The results of comparing the mean interaction effects of cultivar and management on total weed density show that the treatments of Lady Rosetta cultivar × rye, Lady Rosetta cultivar × clover, and Agria cultivar × rye and clover have 22.5, 25.33, 26 and 26 plants/m^2 of total weed density showed the least contamination respectively (Table 5). Also, the average total density of weeds in Jely × Paraquat and Agria × weedy check treatments was 51.33 and 49.66 plants/m^2, respectively, which were the most polluted areas of the field and had a significant difference with

Table 4: Combined analysis of variance for traits of potato cultivars

Sources of variation	df	Mean Square								
		Potato height (30 days after planting)	Potato height (60 days after planting)	Potato coverage percentage (30 days after planting)	Potato coverage percentage (60 days after planting)	Total weed density	Total weed dry weight	Tuber weight	Tuber number	Tuber yield
Replication	1	23.51**	2.5 ns	287.47 ns	60.48**	3.21 ns	14694.4**	28729.6**	0.17 ns	95336854**
Replication (year)	4	4586.27**	1525.18*	178.53 ns	0.73 ns	3.74 *	1166.49**	3136.03**	0.97 ns	10434964**
Cultivar	2	73319.07**	61129.21**	300.71 *	2859.21**	81.67**	40019.63**	450133.03**	39.51**	1410582468**
Cultivar × year	2	0.01 ns	455.83 ns	149.70 ns	1.93 ns	0.21 ns	327.4 ns	11390.70**	0.17 ns	36132941**
Cultivar (year) × Replication	8	510.32**	871.82 ns	189.32 ns	0.97 ns	0.76 ns	429.99 ns	540.05 ns	0.26 ns	1780881 ns
Management	4	119.79**	1859.88**	187.95*	36.53**	2474.25**	969682.24**	803092.9**	213.12**	2603180268**
Management × year	4	0.04 ns	450.27 ns	184.57 ns	2.29*	1.24 ns	3299.528**	1258.1 ns	0.04 ns	3869546 ns
Management × Cultivar	8	5.07**	497.24*	185.39 *	3.08**	6.65**	4122.73**	16898.23**	4.47**	54624948**
Management × Cultivar × year	8	0.04 ns	441.94 ns	184.48 ns	2.15**	0.24 ns	321.53 ns	1915.28**	0.08 ns	6105874**
Error	48	1.68	444.63	174.01	0.87	1.31	263.1	615.56	0.23	2049128
CV (%)	—	2.58	4.69	4.23	7.34	15.80	14.89	2.62	1.12	21.65

*ns, *, ** non-significant difference, significant at 5% and 1% level, respectively.*

Table 5: The comparisons of average values of potato cultivar × weed management on potato traits

Treatments		Comparisons of average								
Cultivar	Potato height (30 days after planting) Management	Potato height (60 days after planting)	Potato coverage percentage (30 days after planting)	Potato coverage percentage (60 days after planting)	Total weed density (No/m^2)	Total weed dry weight (g/m^2)	Tuber weight (g/plant)	Tuber number (No/m^2)	Tuber yield (kg/ha)	
Agria	Weed free	204.5 b	461.5 bc	12.23 b	71 bc	0 g	0 g	1024.17 d	45 c	58343d
	Weedy check	198.83 bc	437.67 cd	12.13 b	56.43 e	47.5 b	569.67 b	648.5 g	38 g	36960g
	Rye	201.5 bc	451.67 c	12.23 b	70.10 c	26 e	268.5 e	928 e	44.66 c	52893e
	Paraquat	198.5 bc	439.33 cd	12.14 b	68.10 cd	46 b	545.83 b	688.33 g	38.16 g	39232g
	Berseem clover	201 bc	450 c	12.24 b	70.10 c	26 e	276.17 e	883.17 e	44.83 c	50338e
Jely	Weed free	190.16 bc	422.67 de	12.16 b	61.03 de	0 g	0 g	1163 b	47.83 a	66288b
	Weedy check	185.5 c	403.33 ef	12.07 b	58.06 e	51.33 a	617.33 a	657 g	40.33 e	37445g
	Rye	187.5 bc	413.33 de	12.17 b	60.06 e	27 e	285.33 e	1099 c	46.33 b	62640c
	Paraquat	185.83 c	404 ef	12.12 b	59.03 e	49.66 a	605.33 a	659.83 g	39.66 f	37608g
	Berseem clover	187.5 bc	378 f	12.18 b	60.03 e	29.33 d	328.5 d	1068.5 cd	46.66 b	60903cd
Lady Rosetta	Weed free	283.83 a	510.33 f	13.86 a	81.13 a	0 g	0 g	1274 a	48 a	72619a
	Weedy check	276.33 a	485 ab	12.10 b	78.13 ab	42 c	493.67 c	835.33 f	41.33 d	47612f
	Rye	280.33 a	495.33 a	13.85 a	79.13 a	22.5 f	225.33 f	1252.67 a	46.66 b	71410a
	Paraquat	274.83 a	486.33 ab	13.66 a	78.21 a	41.5 c	489.17 c	827 f	40.83 de	47278f
	Berseem clover	279.16 a	495.67 a	13.77 a	79.21 a	25.33 e	263.17 e	1198.5 b	45 c	68310b
	LSD %	18.04	26.05	1.29	7.07	1.87	29.72	45.6	0.57	2611.9

Averages with common letters in each column have no significant difference other treatments (Table 5). All 3 weeds, pigweed, common lambsquarters, and field bindweed, had the highest density in Jely treatment, and this shows that Jely has less competitive power. Therefore, the competitiveness of tested cultivars was Lady Rosetta, Agria, and Jely, respectively. Lady Rosetta × rye and Lady Rosetta × clover were the best treatments to reduce the density of weeds. Probably, rye due to rapid germination (3 days after planting) and rapid filling of the space between the rows, reduced the quantity and quality of light reaching the soil surface, and this was an important factor in reducing the density of weeds. Weed control by cover crops can be described by competition for water, nutrients, shading, and creating unfavorable conditions for weed germination under the canopy of cover crops. Findings have shown that cover crops can be an important tool for weed seed bank management by reducing weed pressure in the next crop and potentially reducing the need for tillage or herbicide use. Temperature changes and the reduction of the ratio of red to far-red light under the focus of cover crops are also other reasons for the reduction of weed seed germination (Brust *et al.* 2014). The results of Chen and Robert's (Chen *et al.* 2003; Brust *et al.* 2014) experiment also indicated a decrease in weed density in cover plant treatments. They believe that the complete control of weeds is achieved when the ground covered by the cover crop continues until the ground is completely shaded by the crop plant (Altamas *et al.* 2018). In a report, the cultivation of rye, barley, and rapeseed cover crops caused a 19% reduction in weed density compared to the control treatment without cover crops (Ghaffari *et al.* 2012).

Weed dry weight

The results of the analysis of variance showed that the effect of different treatments on the dry weight of total weeds was significant (Table 4). The results of the comparison of the mean interaction effects of cultivar and management showed that the weeds in the Lady Rosetta x rye treatment faced intense competition, and due to low absorption of water and nutrients, they obtained the lowest dry weight (225.33 g/m^2) (Table 5). The results of comparing the mean interaction effects of cultivar and management on the dry weight of total weeds show that the highest dry weight of total weeds was obtained in the treatment of Jely cultivar with weedy check and Jely with paraquat application, which did not have any significant difference (Table 5). This shows that the use of paraquat herbicide does not have a favorable effect on the management of weeds in potatoes. Paraquat is a contact herbicide; therefore, the application of this herbicide immediately after planting is effective in controlling weeds that have grown. However, it does not have the ability to control weeds during the growing season (Bellinder *et al.* 2000).

The treatments of cover crops in Lady Rosetta cultivar had effectively competed with weeds, and the lowest density and dry weight of weeds were observed in these treatments (Table 5). Experimental results showed that covering the space between the rows with living mulch of cover crops was the main factor in reducing the dry weight of weeds (Pouryousef *et al.* 2015). Also, the result of another experiment showed that berseem clover, as a cover crop, was able to reduce the amount of weed biomass by 65% compared to the control (Babaei *et al.* 2015).

Number of potato tubers

The results of the analysis of variance showed that the effect of different treatments on the average number of tubers/m^2 was significant at the 1% probability level (Table 4). The results of comparison of the mean interaction effects of the cultivar in management on the number of potato tubers showed that the maximum number of tubers was obtained in the treatments of Lady Rosetta × weed free (number of 48 tubers) and Jely × weed free (number of 47.83 tubers/m^2) (Table 5). The lowest number of tubers was also obtained in Agria × weedy check and Agria × paraquat treatments with 38 and 38.16 tubers/m^2, respectively (Table 5). For tuberous plants such as potatoes, proper ventilation and soft soil are important factors in tuber formation. Therefore, it can be said that cover crops increase tuber formation in potatoes by improving the soil structure. A large part of the yield and yield components of potato, such as the number of tubers and the weight of potato tubers, are determined from the flowering stage onwards, and the presence of weeds in these stages can reduce the yield by preventing the formation and bulking of the tubers (Mohammadduos *et al.* 2012; Fakhari and Tobeh, 2013).

Potato tuber weight and yield

The results showed that the effect of different treatments on the average tuber weight per plant and tuber yield per hectare was not significant at the 5% probability level (Table 4). The results of comparing the mean interaction effects of cultivars in management on tuber weight/plant and potato yield showed that Lady Rosetta cultivar treatments with weed free and rye treatment were the best treatments and showed a significant difference at the 5% probability level with average tuber weight of this treatment was 1252.67 g/plant and the yield was 71.4 t/ha^2 than other treatments (Table 5). The treatments of Lady Rosetta × clover with an average yield of 68.3 t/ha^2, Jely × weed free with an average yield of 66.2 t/ha^2 were in the next ranks (Table 5). The weakest treatments were related to the Jely cultivar with weedy check and Agria with weedy check, which yielded 37.4 and 36.9 t/ha^{2,} respectively. Essah *et al.* (2012) showed that cover crops have the potential to increase the yield and quality of potato tubers. Jahanzad *et al.* (2017) observed that white radish and winter pea treatments had the highest yield and potato yield components compared to winter rye and the treatment without cover crops. Cultivation of cover crops in soil increases carbon, organic matter, total nitrogen, and soil fertility and releases nutrients for plants (Ireri *et al.* 2020; Talgre *et al.* 2009; Nyawade *et al.* 2021). The higher the amount of biomass produced by cover crops, the greater the amount of matter transferred to the soil and the greater the effect on soil fertility (Phlavan *et al.* 2009; Zeqiang *et al.* 2024; Maitra *et al.* 2022, 2024; Heydarzadeh *et al.* 2023). By consuming soil moisture, cover crops prevent the movement of moisture in the soil and, as a result, leaching of nitrogen to the lower depths of the soil, and this factor can be one of the reasons for increasing crop yield (Samedani and Rahimiyan, 2007).

CONCLUSION

The findings of the study indicated that, based on the chemical characteristics of paraquat herbicide, its effectiveness in controlling potato weeds such as pigweed, common lambs' quarters, and field bindweed when applied as pre-emergence is limited. In contrast, the use of living mulches from cover crops has proven to be an effective method for managing potato weeds. Given the increasing reliance on chemical herbicides across various crops and the associated environmental and health risks, as well as the reduction in species diversity and genetic erosion caused by herbicide use, it is expected that the use of living mulches from cover crops will contribute to advancing sustainable agricultural practices.

ACKNOWLEDGMENTS

Thank you to all the dear ones who helped in the laboratory and field departments of the University of Mohaghegh Ardabili.

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