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INFLUENCE OF NATIVE WEEDS SPECIES ON GERMINATION, GROWTH PERFORMANCE AND SURVIVAL OF BARLEY SEEDLINGS

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Abstract

Allelopath**y** denotes to a biological marvel wherever the plants interferer plants by discharge of carbon-based chemical (allelo-chemical) in nearby soil atmosphere as water leachate or root exudate. Weeds extracts produced allelo-chemicals which might be prevent the many crop seeds germinations. The entire study was conducted to evaluate the properties of aqueous extract of eight native weeds specie (*Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia, Sisymbrium irio*) on final germination % age and rate of germination, length of root and shoot of seedling and day of survival after germination of barley plants in the laboratory of botany department university of Balochistan Quetta-Pakistan. Aqueous extract of two weeds (*Convolvulus arvensis and Euphorbia helioscopia) were* extra active in seed germination stopping (65%) of barley as compared to other weeds species which showed 70-85% germination. The minimum survival days after germination of seedling was noted for *Amaranthus spinosus, Convolvulus arvensis* and *Sisymbrium irio* which showed 0% germination after Day 12 and 16. Data also indicated that the barley seed showed significant decline in velocity of propagation, germination indices and weight of seedling under the influence of all leaf's weeds extract even though mean germination time was found highest as noted to control.

Key words: Barley, Germination index, Germination rate, Seedling weight, Survival time, Weeds.

Introduction

Weeds are considered undesirable and detrimental plants that have harmful effects on the growth of desired plants and reduces the production potential of those desired plants (Hussain *et al.*, 2021) and Allelopathy is widely considered to be one of the causes of biodiversity reduction (Chu *et al.*, 2014). Weeds are greatest predominant or main class of vermin and inhibit the crops plant by struggle and allopathic effects, resultant in continuously quality and quantity damage of crop. One plant overpowers the development of alternative plants through discharge of bio-chemicals identified as allele-chemical and this portent is known ae allelopathy as reported by Qasem & Foy (2001); Kadioglu *et al*., (2005); Benyas *et al*., (2010) to create weeds monoculture through manipulating species modeling in crop ecosystem (Weston & Duke, 2003). Allelopathy has helpful as well as damaging properties on plant species because of allele-chemicals release, which are secondary metabolites, discharged into the atmosphere by roots exudate and leaching processing through litter decay. Allelopathy plants stock allele-chemical inside their leaf and as the leaf fall down to ground and decay, the poisons discharge in soil and effects neighboring plant. Weeds root are also store the toxins which when discharge and captivated by other plants (Phipps, 2016). Batish *et al*., (2007) reported that the alive as well as lifeless weeds tissues which are remain inside the soil subsequently finishing their life cycle could be harmful effect on the same or nearby crop through the release of allele-chemicals. These allelo-chemicals are stated to be present in virtually all parts of plant counting leaf, stem, flower, bed, pollen grains, roots, rhizome, seed and fruits as stated by Rice, (1984): Sing *et al*., (2003). Though, changes were noted amongst types concerning their allelopathy probable and their aptitude to developed toxic substance in numerous portions (Qasem & Foy, 2001; Veenapani, 2004). The allelopathy possible of weed extracts, plants residue and roots emission has been also stated by numerous other investigators; roots secretion of *Euphorbia corollata* L. (Rice, 1964), *E. esula* L. (Manners, 1987), *E. genicula* Ortega (Sugha, 1979), *E. granulate* Forssk (Hussain, 1980), *E. hirta* L. (Tiwari *et al*., 1985), *E. prostrata* Aiton (Alsaadawi *et al*., 1990), *E. hierosolymitana* Boiss. (Abu-Romman *et al*., 2010) and *E. helioscopia* L. (Qaserm, 1995; Tanveer *et al*., 2010) have been stated in contradiction of crop alike pea, tomato's, wheats, chickpeas, cottons, alfalfas, lettuces, groundnuts and soybeans. Allelopathy action has been credited to numerous phytotoxins such as phenolic acids kaemferol 3-glucuronide and 1-hexacosanol (Rice, 1669; Manners, 1987) contemporary in entire plants. Haig, (2008) divided the allele-chemicals into many categories, like alkaloids hydroxamic acid, terpenoids, glucosinolates, phenolic compounds, flavonoids, quinoids and polyacetylenes. Allelopathic in cereals plants was qualified typically to hydroxamic acid (Sanchez-Moreiras *et al*., 2004). Various this usual compound has exposed to be capable forecasts for usual insecticides expansion (Dayan *et al*., 2009; Ma *et al*., 2011). Marwat *et al*., (2004); Tanveer, (2008), reported dragon spurge (*E. dracunculoides* Lam.) is also a significant components of weeds floras in season crop alike wheats and chickpeas, particularly in rain fed area. Asghari &

Tewari, (2007) described that bio-herbicides signify answer to weighty usage of synthetically herbicides causes thoughtful threat to atmosphere, consumer and increase cost of crop productions, therefore allele-chemical might be recycled to grow novel implement to battle the development of herbicides confrontation in weed as noted by Anjum & Bajwa, (2010). A similarly weeds extract of allelopathy plant is used as an herbicides as reported by Dayan, (2002); Singh *et al*., (2005). Due to bio-synthesized herbicide are effortlessly decomposable, they are supposed to be much harmless than manufactured herbicide (Duke *et al*., 2000). Numerous writers stated employment plant extract for regulatory weed by adjustable attainment (Hussain *et al*., 2007; Iqbal *et al*., 2009; Naseem *et al*., 2009). Allelo-chemical are harmful to crops plant subsequent in decrease and late propagation and decrease in seedling growth (Herro & Callaway, 2003). Consequently, identification of weeds species with allelopathy property and description of their contrary effect in contradiction of related crop is obligatory for a healthier understanding of weeds crop interactions. Furthermore, greatness of allelopathy conquest is supposed to differ by samples preparations and pulling out methods (Zielinski & Kozlowska, 2000; Javaid *et al*., 2011).

Slight recognized around allelopathy effect of *Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia* and *Sisymbrium irio* in contradiction of some related crops but there is no statistics about influence of these native weed species on Barley crop in Balochistan agro-climatic condition. Consequently, the subsequent investigations were piloted to assess the effect of these native weeds plant on germination, survival, and evolution of barley seedling.

The main objective of the study was to determine the Allelopathic effect of natural weeds species (*Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia* and *Sisymbrium irio)* on germination, growth performance and survival of barley seedling.

Materials and Methods

Plant sample and preparation of extract: Completely grownup healthy leaves of 8 different native weed species (*Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia* and *Sisymbrium irio)* were together from the open field crop of Barley around the Quetta district Balochistan Pakistan. Leaves samples were eroded carefully by purified water and dehydrated in shadow for 15 days. The dry sample were pulverized into ash and stored until utilized. Aqueous leaf extract was made through soaked 10gm of ground leaves material in 100ml purified water for 24hr. The extract was filtered through utilization of whatman No.1, filter paper and leaf extracts were store in a flask as a stock solution.

Seed treatment: Barley (*Hordeum vulgare* L.) seeds were taken from local market of Quetta and agricultural research center of Quetta Pakistan. Crop seed were soaked in individual concentration (100% W/V) of aqueous extract of respective weeds and distilled water for at least ½ hr. After that the seeds were sited on petri dish (10 seeds / plate) enclosed moisturized filter paper watered with individual leave extract. Soaked seeds in purified water were helped as control. Apiece action was replicated thrice. Petri dishes were wet once in every 2-3 days by either diverse weed leaf extracts or purified water for control, if essential. Petri dishes were hatched at room temperature (25.0 ±2.0^{o}C) and diverse propagation limitations were everyday up to 4-6 days or pending the last seed germination. Unalike incubations indices composed with percentage of germination, growth rate, coefficient of velocity (Maguire, 1962), mean germination time (Ellis & Roberts, 1981) and germination indices (Anon., 1983) were intended. In addition to germination characteristics, growth parameters were also noted, that included length of root and shoot and seedling survival in response to extracts of different native weeds with the internal of 4 days (day 4th, 8th 12th 16th, 20th and 24th) and seedling weight were also noted daily up to 6 days and then average was calculated.

$$\text{Final \% age of germination (g)} = \frac{\text{Total germination seeds at the close of experiment}}{\text{No. of initial seeds used into 100 times}}$$

$$\text{Mean germination time (MGT)} = \sum Fx / \sum F$$

where F indicated number of seeds germinated on X Day

$$\text{Coefficient of germination velocity (CGV)} = N_1 + N_2 + N_3 \text{ ------ + Ni / 100 X N1T1 + ------ + NiTi}$$

where N indicated number of seeds germinated every day and T indicated number of days from seeding corresponding to N.

$$\text{Germination indices (gi)} = (20 \text{ X } N_1) + (19 \text{ X } N_2) + \text{-------- + (1 X N20)}$$

where N1, N2, ------ N24 indicated number of germinated seeds on 1st, 2nd and 3rd and subsequent days until 24th day and multiplier (e.g. 20, 19, 18, ------- etc) are weight given to the days of germination.

$$\text{Mean germination rate (mgr)} = CV / 100 = 1/T$$

where, T indicated mean of germination time and CV is the coefficient of velocity.

Statistical analysis

Statistics were exposed to examination of variance which (ANOVA) trailed by design of fishers leas + significant changes and Duncan multiple range test (Gomez & Gomez, 1984).

Result and Discussion

Percentage of germination and survival of barley seedlings in response to extracts of different weeds plant: Highest germination percentage was observed in control Petri dishes of barley seeds which showed 90% seed germination during all the investigated periods while the Barley seed germination was found declined in all the weeds leave extract with ranged between 65-85% as shown in (Table 1). Data also showed slightly decline in survival of barley seedlings in response to extracts of different weeds with increase of times from day 8 to 24. Highest decline in germination percentage was observed on day 24th that was in the range of; 0-20% and maximum germination was noted on day 8th after planting that was in ranged between 85-100% for all the examined weed species as revealed in Table 1. Similar observation was also noted by Ali El Keblawy, (2012), they found decline in germination percentage of *P. vata* were significant (p<0.001), it was also reported that together radish and rocket extract was operative in germination inhibition of both *P. ovata* seeds. Many researchers have designated the allele-pathy superior effect of grass family like; wheat, Oat and sorghum residues, for example comprehend water solvable material which are poisonous to the development of wheat seedling (Guenzi *et al*., 1967; Li *et al*., 2005; Zuo *et al*., 2006). Additionally, the root and shoot extract of whesat varieties meaningfully stop together propagation and radicle development of grass (Wu *et al*., 1998). In addition to that several studies have reported that sorghum acts as an allelopathic crop, decreasing the growth and ecophysiological attributes of surrounding plants and weeds growing simultaneously or subsequently in the field (Hussain *et al.,* 2021). The presence of weeds in agricultural fields decreases the quantity as well as the quality of the agricultural products, resulting in enormous financial losses for farmers (Sari´c-Krsmanovi *et al.,* 2019).

Effect of native weed species leaves extracts on germination indices on Barley seedling: Germination velocity, Germination index and Seedling weight (gm) of barley were found (0.282-0.412, 1.820-2.152% and 0.100-0.188 g respectively**)** significantly less under the influence of different native weeds species (*Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia* and *Sisymbrium irio*) 100% leave extract as compared to the control (0.520, 2.350 and 0.286 g) at $p \leq 0.05$ as shown in (Table 2). Alike comments were also described by Mohsin *et al*., (2016) they observed less germination velocity, Germination index and Seedling weight (gm) compared to other leave extract concentrations; 25%, 50% and 0% (control) of *F. benghalensis* in maize seeds. However the enter investigation presented that the mean germination time of barely seeds were meaningfully high (2.752-3.250) in 100% leave extract of all the investigated weeds species as compared to control (0 %) at 0.05 significant level that was found 2.410 days as exposed in Table 2. The declined in Seedling weight of maize plant was noted by Mohsin *et al*., (2016), when the maize plant was treated by *F. benghalensis* extract as likened to control. Siddiqui *et al*., (2009) reported that the seeds germination depend on the concentration of extract, the higher the concentration showed grater allelopathy potential than that the lower concentrations of leaf extract on incubation (Siddiqui *et al*., 2009).

Table 1. Percent germination and survival of barley seedlings in response to extracts of different weeds.

Treatments	Percent germination	Harvest day after germination of seedlings				
		Day 8	Day 12	Day 16	Day 20	Day 24th
Control (no weed extract added)	90	90	90	90	90	90
Alhagi maurorum	70	85	80	20	20	20
Amaranthus spinosus	85	90	0	0	0	0
Amaranthus viridis	70	100	100	20	15	15
Avena sativa	75	90	90	30	15	15
Chenopodium album	70	85	80	20	15	15
Convolvulus arvensis	65	100	0	0	0	0
Euphorbia helioscopia	65	100	100	20	10	5
Sisymbrium irio	75	95	95	0	0	0

Influence of different weeds extract on barley root and shoot length: In barley seeds shoot and root length showed significant variation by soaking in different weed extract as likened to control. Seeds showed low root and shoot length in *Alhagi maurorum, Amaranthus viridis, Avena sativa, Chenopodium album* and *Euphorbia helioscopia* weeds extract likened to control with slightly significant variation during throughout the investigated periods (days 4-24) after the seed germination as reported in Figure 1. Barley seed soaking in *Amaranthus spinosus* and *Convolvulus arvensis* extract after germination (day 8) stop its root and shoot length till day 24. However, in *Sisymbrium irio* extract barley seed stop its root and shoot length after day 12 of germination at the same time control seed continued its growth which is highly significant variation as exposed in (Fig. 1). The decline or stop in root and shoot length of barley seedling after germination might be due to the release of allele-chemical (leave extract) from *Amaranthus spinosus,*

Convolvulus arvensis and *Sisymbrium irio* extract. Biological variations throughout seeds propagation offer rudimentary fram wok for subsequent growth and development. *Eucalyptus grandis* leaf extract was used by Abugre *et al.*, (2011) for seed propagation of *Vigna ungiculata* and noted that the propagation was encouraged nonetheless radicle and palmule growth were stopped through extract of all trees. Earlier, it was found that the leaf and bark extract of *Ficus benghalensis* stopped seeds propagation in *Vigna radiate* (Jayakumar *et al*., 1998). Diverse weed extract alike *Glycyrhiza gladra, Sorghum halepense* and *Reseda lutea* increased the seeds germination of chickpea with 95, 94 and 93% correspondingly (Kadioglu *et al*., 2005). Seeds propagations depend on the type and concentration of aqueous extract (Siddiqui *et al*., 2009). Mohsin *et al*., (2016) utilized *ficus benghalensis* L. leaf extract on early seedling and growth development of Maiz, sunflower and Mungbean and found decline in sunflower root length through seed treatment as compared to controlled. Results presented in (Fig. 2) designated that the mean of root and shoot length (cm) of days 12 old barley seedling under control and extracts of various weeds were significant different. Bars with different letters also designated that there was significant difference in leaves extract among the investigated weed varieties at $p<0.05$. The maximum effect of extract showed after day 12 of seedling which might be the slow released of allele-chemicals from weeds extract. Macías *et al.*, (2019) reported that the weeds compete with crops for resources such as light, nutrients, space, and water, causing plant yields to suffer. Researcher indicated that the allelopathy is a kind of force that might be augmented the level of chlorophyll contents subsequent in cumulative capability of photosynthesis (Salisbury & Ross, 1991). The utmost stick of allelopathy outcome of plant extract was noted on root length since they are more subtle to phytotoxic mixes as likened to hypocotyl. Nishida *et al*., (2005) stated the permeability of allelopathy substances to root tissues were well than that of shoot tissues. Dhole *et al*., (2013) noticed that the leaves extract of *Euphorbia hirta* gave stimulatory outcome on seed development, shoot and root length tracked by *Protulaca oleracea*. Allelo-chemicals from *Ficus* species was stated to break the growth by altering carbon-based differences in bloom forming algae (*Chlorella pyrenoidosa*) with change in reactive oxygen, species and reduction in photosynthetic aptitude and cell membrane penetrability (Jiang *et al*., 2014).

Table 2. Influence of native weeds species leaf extract on germination indices in barley seedling.

Weeds name	Treatments (%)	Germination velocity	Mean germination time	Germination index	Seedling weight (g)
Alhagi maurorum	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.282 ± 0.01	2.841 ± 0.06	1.820 ± 0.02	0.122 ± 0.01
	$LSD_{0.05}$	**0.762***	**0.341***	**0.244***	**0.072***
Amaranthus spinosus	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.321 ± 0.03	2.823 ± 0.00	2.012 ± 0.00	0.100 ± 0.01
	$LSD_{0.05}$	**0.126***	**1.012***	**0.241***	**0.125***
Amaranthus viridis	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.412 ± 0.00	2.752 ± 0.00	2.130 ± 0.01	0.178 ± 0.00
	$LSD_{0.05}$	**0.100***	**1.022***	**0.200***	**0.050***
Avena sativa	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.410 ± 0.00	3.232 ± 0.04	2.110 ± 0.00	0.188 ±0.00
	$LSD_{0.05}$	**0.110***	**0.520***	**0.200***	**0.081***
Chenopodium album	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.411 ± 0.00	3.221 ± 0.03	2.131 ± 0.04	0.174 ± 0.01
	$LSD_{0.05}$	**0.180***	**0.078***	**0.179***	**0.048***
Convolvulus arvensis	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.314 ± 0.00	3.001 ± 0.00	2.070 ± 0.07	0.121 ± 0.02
	$LSD_{0.05}$	**0.056***	**0.572***	**0.152***	**0.110***
Euphorbia helioscopia	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.286 ± 0.04
	100	0.407 ± 0.02	3.250 ± 0.01	2.152 ± 0.00	0.163 ± 0.02
	$LSD_{0.05}$	**0.110***	**0.473***	**0.110***	**0.110***
Sisymbrium irio	0	0.520 ± 0.04	2.410 ± 0.15	2.350 ± 0.12	0.266 ± 0.04
	100	0.304 ± 0.01	3.000 ± 0.02	2.021 ± 0.05	0.108 ± 0.00
	$LSD_{0.05}$	**0.063***	**1.027***	**0.089***	**0.126***

where, 0% = without weed extract (control), 100% = 100% weed leaves extract

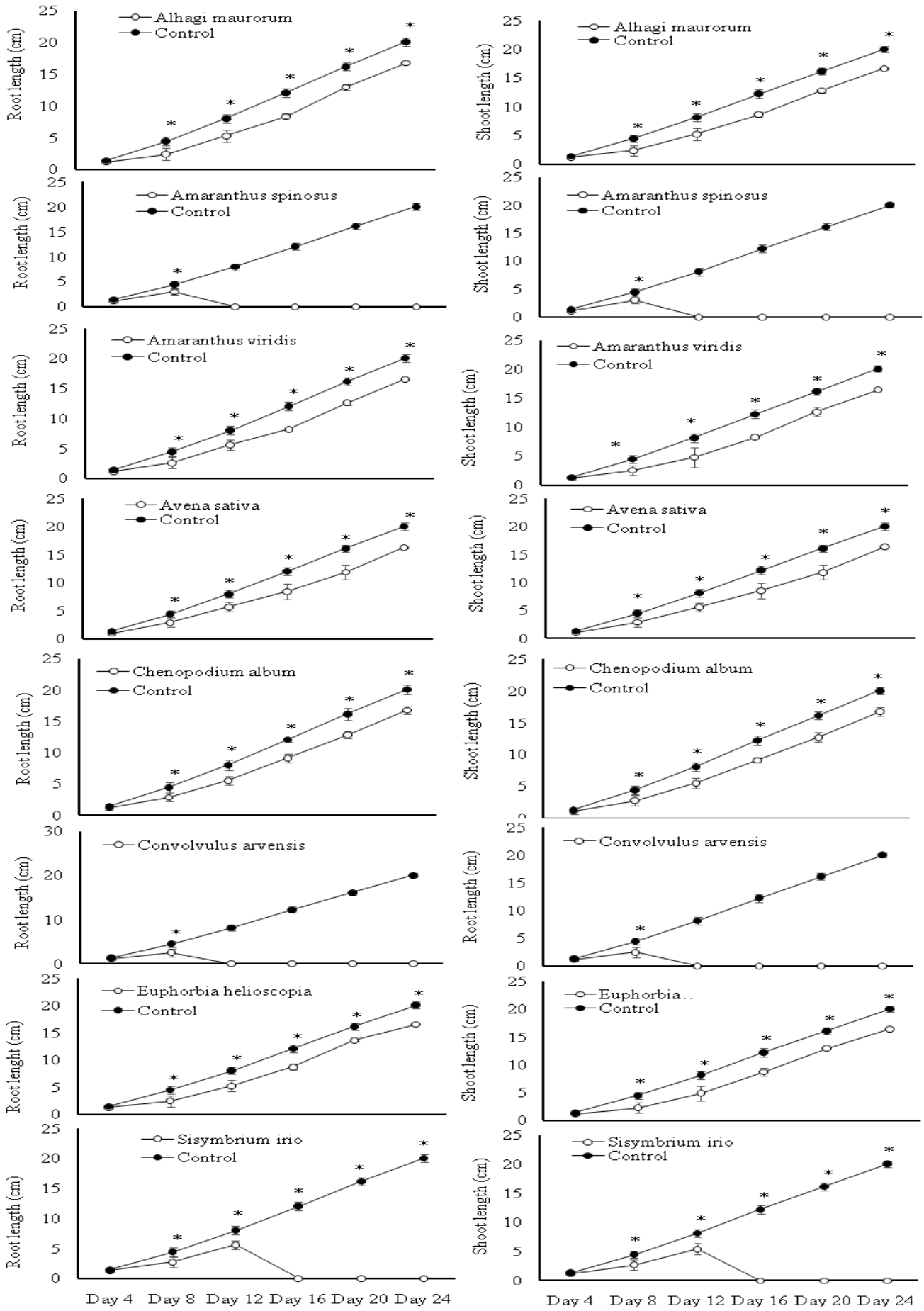

Fig. 1. Effect of different native weeds leaves extracts on root and shoot length and germination rate of barley seedling.

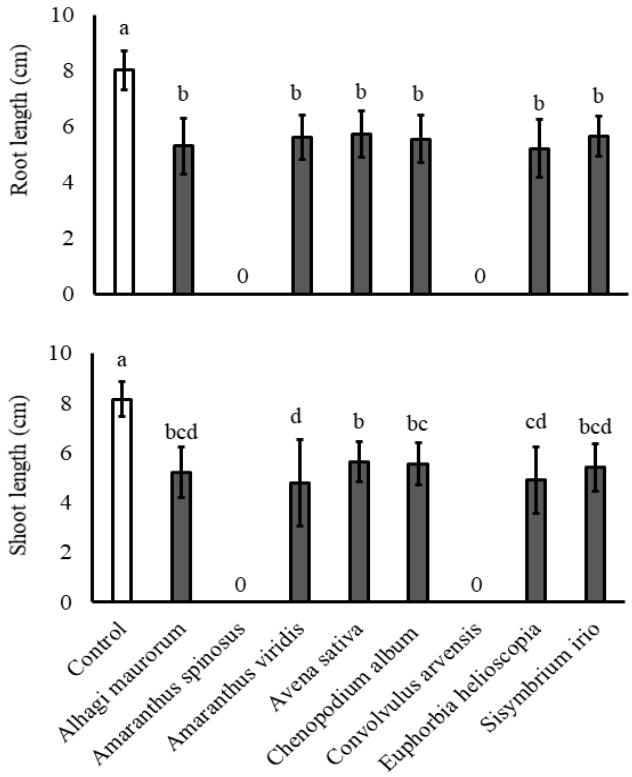

Fig. 2. Mean (± SD) of root and shoot length (cm) of 12 days old barley seedlings under control and extracts of various weeds. Bars with different letters indicates significant difference at $p \leq 0.05$.

Conclusion

Fromcan this investigation it can be concluded that *Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia* and *Sisymbrium irio* leaf extract contributed inhibitory reply on seed germination root and shoot elongation, survival days after germination and seedling length of barley. On the other hand, more study would be approved to examine the apparatus of reserve on these frugally significant harvests. Separation and documentation of allelochemicals existing in *Alhagi maurorum, Amaranthus spinosus, Amaranthus viridis, Avena sativa, Chenopodium album, Convolvulus arvensis, Euphorbia helioscopia, Sisymbrium irio* must be studiedit can be used as natural herbicide in controlling wees.

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