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The allelopathy effect of medicinal crop (A*loe vera* (l.) Burm.f.) On their associated weeds in grid zone of Madhya Pradesh

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Abstract

The demonstration was conducted through Krishi Vigyan Kendra at adopted village Bhikampura, Block Lahar, Distt- Bhind) during Kharif season of 2017and 2018 conducted on 06 ha of 12 innovative farmer's field. Was laid out due to improper weed management is one of the major bottlenecks in realizing the potential of allelopathic effect of medicinal plant on germination and growth of their associated weeds of aloe vera crop under gird zone of Madhya Pradesh situation. The allelopathic effect of medicinal crop Aloe vera *(L.) Burm.f. was evaluated on germination and growth of their associated weeds. Water extracts from fresh leaves in concentrations 04 to 14% were examined in farmers field.Application of water extracts showed no effect on germination of pigweed (*Amaranthus retroflexus *L.) slender amaranthus(*Amaranthus virdis *L.), redroot.), scentless mayweed (*Tripleurospermum inodorum *(L.) C.H. Schultz) and velvetleaf (*Abutilon theophrasti *Medik.), however the highest extract concentration reduced germinationof black nightshade (*Solanum nigrum *L. emend Miller) and dayflower (*Commelina benghalensis *L.)for 19.6%. Root length of weed species was not affected by extracts, while shoot length,fresh and dry weight of black nightshade, redroot pigweed and velvetleaf seedlings was stimulated. Among weed species, scentless mayweed proved to be the most tolerant.*

Key words: allelopathy, Aloe vera, Abutilon theophrasti,Amaranthus retroflexus,germination,Solanum nigrum, Tripleurospermum inodorum

Introduction

Allelopathy is a biological phenomenon in which plants affect each other, positively or negatively, through the production of allele chemicals released into the environment (Rice, 1984.). Allelopathy has an important role in natural ecosystems, agriculture, silviculture and aquatic biosystems (Erhard, 2006). One of the main possibilities of exploiting suppressive allelopathic effect in agriculture is its implementation in integrated plant protection systems as an alternative measure of weed control. Allelopathic plants with high potential are considered as a source of new molecules with herbicidal action (Bhowmik *et al.*, 2003). 50*Aloe* is genus of over 500 species, perennial plants of tropical and subtropical areas, indigenous to African and Mediterranean countries. They are typical xerophytes that have adapted to dry climates with their thick fat leaves with a strong cuticle (Kežman, 2015). *A. vera*(L.) Burm.f., *A. arborescens* Miller. and *A. vera* var. *chinensis* (Haw.) A. Berger are the most important species belonging to the genus (Bozzi *et al.*,2007). *A. vera* is a valuable medicinal herb that is used in the pharmaceutical and food industry and cosmetics (Ilbas *et al*., 2011) as pills, sprays, lotions, creams, jellies and drinks (Datta *et al.*, 2012). The fleshy leaves are the source of gel and latex (Boudreau and Beland, 2006) which containnumerous bioactive chemical components (Shelton, 1991). Except for its antioxidant, antifungal, and antibacterial properties (Hosseinimehr *et al*., 2010), *A. vera* possess allelopathic effect on mainly crops and some weeds (Hanafy *et al.*, 2012.).The aim of the study was to evaluate the effect of different concentrations of water extracts from fresh leaves of *A. vera* on germination and early growth of four weed species.

Materials and Methods

The experiment was conducted on farmers, field of Mehgown Block, District Bhind (M.P) through ATMA and also involved soil testing laboratory Bhind

for testing Phytopharmacy values of Aloe vera crop. Water extracts were prepared from medicinal plant of *A. vera* following the procedure similar to Hanafy *et al.* (2012). 140 g. of fresh *A. vera* leaves were cut into small pieces and blended with 1000 ml of water.The mixture was kept for 8 hours on room temperature, after which was filtered through muslin cloth and filter paper to obtain 14% concentration extract. The extract was further diluted to obtain concentrations of 04,06,08,10,12 and 14%Response of six weed species to water extracts was evaluated: dayflower (*Commelina benghalensis* L.). black nightshade (*Solanum nigrum* L. emend Miller) Redroot pigweed (*Amaranthusretroflexus* L.) Velvet leaf (*Abutilon theophrasti* Medik.) Slender amaranthus (*Amaranthus virdis* L.), scentless may weed (*Tripleurospermum inodorum* (L.) C.H. Schultz) and however the highest extract concentration reduced germination of and Weed seeds were collected after ripening in from the Gird zone of farmer's fields, cleaned of impurities and stored in paper bags. Seed dormancy of all weed was removed by immersing seeds in 2% KNO3 solution for 24 h, while hot water treatment at 60 °C for 60 minutes was used to overcome velvetleaf dormancy (Ravliæ *et al.*, 2015). Prior to each experiment, the seeds were surface-sterilized for 20 min with 1% NaOCl, and then rinsed three times with distilled water (Siddiqui *et al.*, 2009).

Effect of water extracts was evaluated through plots at four farmer's feild.In each feild 45 weed seeds were placed on farmer's field and equal amount of certain extract was added (3 ml for black nightshade, redroot pigweed, scentless mayweed and 5 ml for velvetleaf). The seeds of Day Flower, Slender amaranth, redroot pigweed, scentless mayweed and Velvetleaf were left to germinate on farmer's field for 5 to 7 days, while black nightshade seeds were germinated for 10 days. The experiments were carried out in a completely randomized design with four replications .The seed germination was calculated for each replication using the formula: G (germination) = (germinated seeds/total seeds) x 100. Seedlings root and shoot length (cm) were measured and their fresh and dry weight (mg) was determined using electronic scale at the end of the experiments. The collected data were analyzed statistically with ANOVA using statistical program and differences between treatment means were compared using the LSD-test at the probability level of 0.05.

Results and Discussion

In general, application of *A. vera* water extracts showed no significant impact on germination of weed species (Figure 1). Negative allelopathic effect was recorded only on germination of *S. nigrum and C.* seeds in treatment with extract of the highest concentration which reduced germination for 19.6%

Figure 1. Allelopathic activity of *A. vera* water extract on germination percentage of weeds. Growth of the tested weed species was differently affected by *A. vera* water extracts (Table1). Compared to the control *benghalensis.*

Means followed by the same letter within the column for each weed species are not significantly different at P<0.05. None of the applied concentrations had effect on root length of the tested species. On the other hand, extracts showed positive effect on shoot growth of weed seedlings especially in treatments with higher extract concentrations. Increase in shoot length of C. benghalensis , *S. nigrum*, *A. retroflexus* and *A. theophrasti* amounted up to 12.73,20.00,17.02 &5.36 respectively, compared to the control treatment. Fresh and dry weight of C. benghalensis & *S. nigrum* seedling was significantly increased with all extract concentrations, as well as fresh weight of *A. retroflexus* seedlings.

The results of the experiment showed that extracts from fresh leaves of *A. vera* had little or mainly positive effect on germination and growth of common weed species. Other researchers also recorded positive allelopathic activity of *A. vera* in bioassays. Extracts stimulated germination and seedlings growth of oil pumpkin (*Cucurbita pepo* var. *oleifera* Pietsch) and wheat (*Triticum aestivum* L.) according to Bernatoviæ (2016).

Positive effect of *A. vera* extracts was also recorded in pot and field experiment. According to

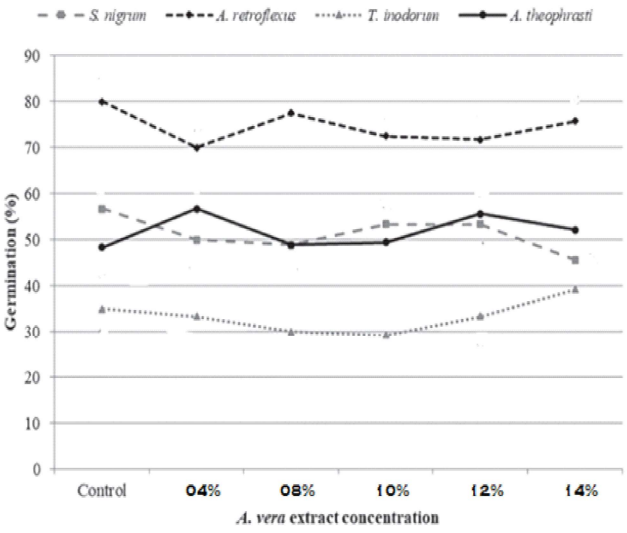

Table 1: Allelopathic activity of *A. vera* water extract on seedling growth of weeds.

	Root length (cm)	Shoot length (cm)	Fresh weight (mg)	Dry weight (mg)
Day Flower (*Commelina benghalensis* L.)				
A. vera extract concentration				
Control	1.56	1.10	3.68	0.43
04%	1.65	1.05	4.39	0.41
08%	1.24	1.09	4.72	0.44
10%	1.26	1.67	5.35	0.45
12%	1.27	1.25	5.66	0.46
14%	1.22	1.24	5.75	0.47
Black Nightshade (*Solanum nigrum* L. emend Miller)				
Control	1.31	0.95	3.23	0.31
04%	1.58	0.90	4.28	0.38
08%	1.18	0.94	4.61	0.37
10%	1.21	1.52	5.15	0.39
12%	1.26	1.17	5.60	0.41
14%	1.16	1.17	5.79	0.44
Redroot Pigweed (*Amaranthus retroflexus* L.)				
Control	1.24	3.35	4.89	0.30
04%	1.17	3.53	5.52	0.29
08%	1.11	3.64	5.31	0.30
10%	1.32	3.62	5.61	0.30
12%	1.14	3.93	6.68	0.31
14%	1.23	3.92	6.50	3.33
Velvetleaf (*Abutilon theophrasti* Medik.)				
Control	2.09	2.98	58.88	4.82
04%	2.18	3.44	57.55	4.70
08%	1.93	3.41	56.88	4.87
10%	1.78	3.71	55.48	4.18
12%	1.91	3.53	58.05	5.11
14%	1.87	3.14	49.52	5.19
Slender Amaranthus (*Amaranthus virdis* L.),				
Control	1.26	3.38	4.93	0.35
04%	1.19	3.56	5.56	0.34
08%	1.13	3.67	5.37	0.35
10%	1.34	3.65	5.66	0.35
12%	1.16	3.96	6.71	0.36
14%	1.25	3.95	6.53	0.38
Scentless Mayweed (*Tripleurospermum inodorum* (L.) C.H. Schultz)				
Control	0.37	0.64	0.77	0.09
04%	0.33	0.61	1.01	0.10
08%	0.30	0.66	0.89	0.09
10%	0.34	0.62	0.91	0.10
12%	0.33	0.64	1.03	0.10
14%	0.35	0.66	1.15	0.09

Youssef (1997) seeds soaked in *A. vera* extract increased fresh and dry leaf weight and number of flowers in *Consolida ajacis* (L.) Schur and *Callistephus chinensis* (L.) Ness. Plant extracts according to El-Shayeb (2009) increased both growth parameters such as plant height, leaf and flower number and weight as well as seed yield and chemical composition of oil in common evening primrose (*Oenothera biennis* L.). Increase in plant height, number and fresh and dry weight of leaves in *Schefflera arboricola* (Hayata) Kanehira was reported by Hanafy *et al.* (2012) when *A. vera* extracts were applied either as a soil drench or a foliar spray.

However, negative effect on crops and weed species was equally recorded. According to Rogiæ (2016) *A. vera* extracts reduced germination of lettuce and rocket salad (*Eruca sativa* (L.) Mill.) up to 20.2%. The results showed high negative potential of extracts, over

90%, on wheat, rye (*Secale cereale* L.), garden cress (*Lepidium sativum* L.), redroot pigweed and dandelion (*Taraxacum officinale* (L.) Weber ex F.H. Wigg), especially with the highest concentrations. Differences could be attributed greatly on the plant biomass used for extracts. Dry plant biomass usually shows greater negative potential, even up to 100%, as a result of different concentration of extracted allelochemicals from fresh and dry biomass Balièeviæ *et al.*, 2014).

The results showed that weed species differed in their response to *A. vera* extracts. Frequently, seed size can influence response to allelochemicals with smaller seeds being more susceptible to negative phytotoxic effects (Petersen *et al*., 2001), however the experiment indicated that such hypothesis was not confirmed in the experiment since both seed germination and later seedlings development of scentless mayweed, which was the smallest, was the most tolerant. Seed morphology and physiology could affect difference among tolerance as well as the ability of weed species to adapt to different unfavorable conditions (Khaliq *et al*., 2011).

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