Original Research Article

Allelopathic effects of some fruit plant species with weeds

Abstract: Aqueous extracts of seven fruit plant species viz., banana (*Musa paradiseca*), Indian gooseberry (*Phylanthus emblica*), jack fruit (*Artocarpus heterophyllus*), guava (*Psidium guajva*), mango (*Mangifera indica*), litchi (*Litchi chinensis*), wood apple ((*Aegle marmelus*) were tested for germination, radical and plumule growth of barnyard grass and green amaranth. The lowest germination percentage (9.5 and 14.4%), plumule (3.94 and 0.92 cm) and radicle length (0.825 and 0.495 cm) of barnyard grass and green amaranth seedlings was obtained in seed treated with wood apple aqueous extract due to presence of some toxic compounds or other inhibitory materials in the species. One of these plant extract which performed the best i.e. wood apple have potential for use as alternative crop as herbicide (protectants) against a number of weed species.

Key words: Aqueous extract, germination, radical, plumule

INTRODUCTION

Biochemical interactions (deleterious or beneficial) between the plants are called allelopathy and allelopathic interactions play a vital role in agro- ecosystems, where farming replace the nature flora, than in stable pasturelands Harborne (1988). Various studies have shown inhibitory effects of phytotoxins from weeds on crops (Bhatt et al, 1993, 1994, 2000, 2001 and Kaletha et al, 1996). This information is necessary to develop sustainable cropping systems for this region.

There are different types of plants those are cereals, pulses, oilseeds herbal or medicinal plants, woody plants, narcotic crops, herbaceous plant, shrubs, weeds and fruit plants etc. in the plant kingdom. Different types of naturally occurring organic and bio organic compounds have been isolated from them. Most of them have effective medicinal, insecticidal, pesticidal or toxic and growth regulatory values. The plant kingdom supply us with food, fuel, fodder, shelter, wind breaker, beauty and provide raw material for clothing and medicine (Jalal et al, 2010 and Sachan, 2006). Challa and Ravindra (1998) examined the allelopathic effects of major weeds on vegetable crops. Plant releasing chemical into the environment may how deleterious and beneficial effects on the other plants growing in their vicinity. Certain plant leaves have the herbicidal and insecticidal activities which are available in nature, which checks the environmental pollution and soil pollution. The synthetic or chemical compounds may be toxic and needs careful handling where as botanical or organic herbicides and pesticides are safe and

have no high toxicity (Duke, 1986). Herbicides especially synthetic herbicides are harmful for our environment as well as expensive to farmers. Therefore, the present study was undertaken to examine the influence of aqueous extract of some fruit plants on germination of two weed seeds, and their primary growth rate.

MATERIALS AND METHODS

This study was conducted in the Premises of Krishi Vigyan Kendra, Mon (Aboi), Nagaland, India (26.59ºN latitude, 94.9670ºE longitude and 582.53 m altitude) during October to November, 2020. The mean annual average rainfall was 2467 mm and mean temperature ranged from 13.5 to 16.0ºC. There are seven fruit tree species viz., banana (*Musa paradiseca*), Indian gooseberry (*Phylanthus emblica*), jack fruit (*Artocarpus heterophyllus*), guava (*Psidium guajva*), mango (*Mangifera indica*), litchi (*Litchi chinensis*), wood apple ((*Aegle marmelus*) lessing in this district. The influences of seven major fruit tree species were determined on two selected weeds viz., barnyard grass and green amaranth in petriplate bioassays under laboratory conditions.

The mature leaves of banana, Indian gooseberry, jack fruit, guava, mango, litchi, and wood apple were collected in the last week of September 2020. The leaves were dried and ground separately in a mechanical grinder. The powdered sample, 2 gm of each species was weighed and added to 100 ml distilled water and kept for 72 hours at room temperature (18 ± 2^0C) to make 2% aqueous extracts of each species, respectively. The resulting brownish and dark extractions were filtered through three layers of Whatman No. 1 filter paper and stored in dark in conical flasks, until required. Twenty five seed of each test crop (in four replicates) were placed in sterilized petri dishes (13.0 cm dia.), lined of Whatman No. 1 filter paper. Ten ml extract of each plant was added per petri plate on first day. Distilled water served as control. Moisture in the petri dishes was maintained by adding 2 ml of extract or distilled water as required. The seed germination, radical and plumule growth was recorded at seven days after sowing. The data was statistically analyzed using critical difference at 5% level of significance.

Table 1. An effect of fruit leaves extract on barnyard grass and green amaranth grass seeds.

Treatment	Barnyard grass			Green amaranth		
	Germination (%)	Shoot length (cm)	Root length (cm)	Germination (%)	Shoot length (cm)	Root length (cm)
Banana (T_1)	67.4	5.45	1.32	36.8	1.52	0.965
Indian gooseberry (T_2)	68.6	6.65	1.76	60.4	1.68	1.065
Jack fruit (T_3)	58.4	6.70	2.02	34.0	1.58	0.948
Guava (T_4)	60.0	5.65	1.45	43.5	1.44	1.022
Litchi (T_5)	44.0	4.10	1.05	56.6	1.30	0.855
Mango (T_6)	60.8	5.20	1.85	51.2	1.60	1.044
Wood apple (T_7)	9.5	3.94	0.825	14.4	0.920	0.495
Control water	55.6	5.62	3.25	61.6	1.58	0.942

(TC)						

RESULTS AND DISCUSSION

The aqueous extracts of leaves of fruit trees in 2% concentration. Wood apple leaf extract had significant effect to reduce the growth and germinating of barnyard grass seeds (Table 1). The lowest germination percentage was 9.5% for barnyard grass seeds treated with aqueous extract of wood apple while 54.0%, 58.4%, 60.0%, 60.8%, 67.4% and 68.4% was recorded treated with the extracts of litchi, jackfruit, guava, mango, banana and goose berry. So the reduction of seed germination percentage was found in seeds treated with wood apple possible due to the toxic compounds present in the aqueous extracts. Table 1 shows that the aqueous extract of wood apple had significant effect to reduce the growth of shoot and root length of barnyard grass seeds. The lowest shoot and root growth was due to wood apple (3.94 and 0.825 cm) leaves extract followed by litchi (4.10 and 1.05 cm). The highest shoot length of barnyard grass seedlings was due to effect of the aqueous extract of jackfruit (6.70 cm) leaves possible due to growth inhibitory substances present in it. Similarly, barnyard grass seedlings growth was significantly reduced by the aqueous extracts of litchi leaves as compared with control (5.62 and 3.25 cm).

The lowest germination percentage, shoot and root length of barnyard grass seedlings was obtained in seed treated with wood apple aqueous extract due to presence of some toxic compounds or other inhibitory materials in the species.

The least germination percentage 14.4% was recorded in green amaranth in seeds treated with wood apple as compared the control and other treatments (table 1). The second lowest germination percentage was found 34.0% in seeds treated with jackfruit followed by 36.8% and 43.5% in seeds treated with banana and guava, respectively. The germination percentages on green amaranth 61.6%, 60.4%, 56.6%, 51.2% were found in seeds treated with water, goose berry, litchi, and mango, respectively, which were similar among themselves. The reduction of germination percentage of green amaranth possibly also due to presence of some toxic compounds present in the aqueous extracts, respective species. Table 1 shows that the lowest shoot and root length of green amaranth seedlings (0.92 cm and 0.495 cm) was recorded in seeds treated with wood apple. The second lowest shoot and root length of green amaranth seedlings in seeds treated with litchi (1.30 cm and 0.855 cm) as compared with control and other treatments.

REFERENCES

1. Bhatt, B.P. and Chauhan, D.S. (2000). Studies on allelopathic effects of Oak (*Quercus* spp.) of Garhwal Himalaya. *Allelopathy Journal* **7**(2): 265-272.
2. Bhatt, B.P., Chauhan, D.S. and Todaria, N.P. (1993). Phytotoxic effects of tree crops on germination and radicle extension of some food crops. *Tropical Science* **33**: 69-73.

3. Bhatt, B.P., Kaletha, M.S. and Todaria, N.P. (1997). Allelopathic exclusion of understorey crops by agroforestry trees of Garhwal Himalayas. *Allelopathy Journal* **4**(2): 321-328.
4. Challa, P. and Ravindra, V. (1998). Allelopathic effects of major weeds on vegetable crops. Allelopathy J. India 5:89-92.
5. Duke, S.O. (1986). Naturally occurring chemical compounds as herbicides. Rev. Weed Sci. 2:15-44.
6. Jalal, S., Roy, B., Bikash C. Sarkar, Uddin, M.N. and Sona R. Roy (2010). Growth inhibitory effect of ten fruit leaves on selected weeds. J. Agrofor. Environ. 4(1):101-104.
7. Harborne, J.B. (1988). An Introduction to Ecological Biochemistry. New York: Academic Press pp.356.
8. Kaletha, M.S., Bhatt, B.P. and Todaria, N.P. (1996). Allelopathic effects of some agroforestry tree crops of Garhwal Himalaya. *Range Management & Agroforestry* **17**(2): 193-196.
9. Sachan, M.S. (2006). Structure and functioning of traditional agroforestry systems along an altitudinal gradient in Garhwal Himalaya, India. Ph. D. Thesis, HNB Garhwal University, Srinagar, Garhwal (UK).