

Phytotoxic Effect of *Calligonum Polgonoides* Extracts on Germination of *Abelmoschus esculentus* and *Helianthus annuus*

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ABSTRACT

The present study was carried out to record and report the phytotoxic effect of *Calligonum polygonoides* Extract on Germination of *Abelmoschus esculentus* and *Helianthus annuus*. *Calligonum* is a Cushion shaped xeric shrubby plant which is widely distributed throughout sandy xeric habitat of district Bannu Pakistan. This plant is restricted to certain area such as Domel. It is locally used for fuel and Naswar preparation. This plant has inhibitory effect on germination of radicle and plumule of seed. In this study the effect of different concentration (0 mg/ml, 5mg/ml, 7mg/ml, 10mg/ml) of shade dry leaf methanol extract of *Calligonum polygonoides* on germination of *Abelmoschus esculentus* and *Helianthus annuus* were investigated. The results showed that the methanol extract of this plant gradually decreased the germination percentage, especially at higher concentration. The radicle and plumule length were also affected by different concentration. Maximum growths were occurred at control Petri dish; the growth decreased as the concentration of extract increased; growth become Minimum at higher concentration. It is concluded that presence of *Calligonum polygonoides* in the field may retard the germination and seedling of *Abelmoschus esculentus* plants and *Helianthus annuus*.

Keywords: Phytotoxic effect, *Calligonum polygonoides*, *Abelmoschus esculentus* and *Helianthus annuus*.

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INTRODUCTION

A fairly common plant of sand dunes in Southern Baluchistan and Trans-Indus plains, also found in certain area of District Bannu. The wood is chiefly used as fuel. The flowers are also eaten in Sindh; *Calligonum polygonoides* plant is commonly known as Phog, it is locally known as Bananza; it is a small much branched leafless, shrub found sandy soil xeric condition. It is usually 4-6 feet but occasionally may reach up 10 feet in height with a girth of 1-2 ft. leave very scanty sessile, minute linear caduceus, 7-15mm long; linear spatulate; stipules very short membranous, obliquely amplexicaul; flowers pink pedicellate, pedicel 3-8 mm long, slightly accrescent in fruit; perianth 2mm long, 2-3 mm broad cleft about two-third the way down; segments 5, obovate, thin, membranous, red with broad white margin: stamen 12, filament swollen, hairy and connate at the base; fruit densely clothed with branched bristles with dilated often confluent bases. It produces root suckers and is easily propagated by cutting and layering. Fl. Per.: April-Jun. This tree is also name orta in old Arabic poems so large number of people agrees that origin of Aorta for great human artery. It is very hardy and being capable of growing under adverse condition of soil and moisture. The *Calligonum polygonoides* is a dominant perennial shrub in active sand dunes and stabilize sand fields in most desert area (Tao, 2000) *Calligonum* genus belongs to family Polygonaceae, with some 80 species distributed throughout Western Asia, Southern Europe and North Africa (Okasaka et al., 2004). *Calligonum* L. is an ancient genus of the arid desert flora of North Africa. Iran, Iraq, Pakistan, Russia, Turkey, Palestine and Syria. *Calligonum* L. has been playing a important role in the stability of the natural and planting vegetation ecosystems of the desert of the Tunisia. The

species belonging to this genus have great potential and importance because of providing different products and services, such as forage, traditional medicines, arresting desert encroachment and stabilizing sand dunes.

MATERIAS AND METHOD

The present study was conducted during 2012-13. *Calligonum poygonoides* leaves were collected from Domel area of District Bannu in Khyber pakhtunKhwa Pakistan. All leaves were washed with distilled water to remove dust and other residues, than the leaves were dried under shade. The dried samples were than crushed to powder form by electric Grinder. After that, leaf powder were soaked in 70% methanol 1:10 (w/v) for 72 hours at room temperature. The methanol extract was collected by use of Whatman filter No. (Al.Zahrani and Al-Robai, 2007). Methanol and water was evaporated while extract was obtained. After extraction, stock solution of .5g/50ml or 10mg/1ml was prepared, further dilute concentration of stock solution are (0mg/1ml, 5mg/1ml, 7mg/1ml, 10mg/1ml) were prepared, distilled water as the control treatment. Seed of *Abelmoschus esculentus* (*Hibiscus esculentus*) and *Helianthus annus* were selected for this research. There are four replication, in each replica there were three Petri dish. Three Petri dish were selected for each concentration; 15ml of each concentration were prepared. Added 5ml extract concentration to each Petri dish of replica. After drying blotter paper 7 seeds were grown in each petridish. Three petridish of 0mg/1ml was taken as a positive control of all these treatments. *Abelmoschus esculentus* and *Helanthus annus* (RA-713) were selected for this study. Statistical analysis of data was carried out by using SPSS and Excel soft

ware. Comparison of mean was carried out by with the Duncan,s multiple test using SPSS.

RESULT AND DISCUSSION

Percentage of Germination

Mean comparison showed that there was a significant different among control with 5mg/1ml, 7mg/1ml and 10mg/1ml in *Abelmoschus esculentus* but 10mg/1ml showed significant different with control and 5mg/1ml ($P < 0.05$). There was no significant difference between 5mg/1ml and 7mg/1ml. The results showed that leaf extract of *Calligonum polygonoides* reduced germination percentage in *Abelmoschus esculentus* plants. In seed germination of *Helianthus annus* significant difference were not found between control and other treatments (5mg/1ml, 7mg/1ml, and 10mg/1ml).

In treatment of 10mg/1ml, germination percentage of seeds of *Helianthus annus* were 73.91%, while germination percentage of 7mg/1ml, 5mg/1ml and control were 73.91 %, 82.60%, 100% ,respectively similarly the germination percentage of *Helianthus* seeds at control were 100% while germination of *Abelmoschus esculentus* treatments at concentration of control, 5mg/1ml, 7mg/1ml and 10mg/1ml were, 100% 39.13%, 28.69% and 21.73%. Therefore, the greatest and least inhibitory effect of leaf extract on percentage of seed germination was belonged to *Abelmoschus esculentus* plant seeds. Effect of different concentration level of plant extract on *Abelmoschus esculentus* and *Helianthus annus* seed germination were shown in Table.1 and 2

Growth of Radicle and Plumule

The result showed that the differences among treatment were significant in *Abelmoschus esculentus*(plant but in *Helianthus annus* plant there were no significant difference , highest length of

radicle and plumule observe in control seeds which were shown in (Table 1 and table 2)

Growth of Radicle

With increasing of extract concentration, inhibitory effects of extracts on radicle growth increase, therefore highest reduction in radicle length observed in treatment of 10mg/1ml. In *Abelmoschus esculentus* the differences in radicle growth between Control and 5mg/1ml was significant similarly the difference between 5mg/1ml and 7mg/1ml was also not significant, but there was significant difference among control with 5mg/1ml, 7mg and 10mg/1ml ($p < 0.05$) similarly the different between 5mg/1ml and 10mg/ is also significant but there was no significant difference between 5mg/1ml and other treatments although growth of radicle, decrease. In *Helianthus annus* the difference in radicle growth between control and other concentration. ie 5mg/1ml, 7mg, 10mg/1ml was not significant.

Growth of plumule

Application of leaf extract of *Calligonum polygonoides* reduced plumule length in *Abelmoschus esculentus* (*Hibiscus esculentus*) and *Helianthus annus* (table 1 and Table 2). In all plants, the highest reduction in plumule length observed in 10mg/1ml treatment. In *Abelmoschus esculentus* (*Hibiscus esculentus*) there was no significant difference were found in between control and 5mg/1ml treatment but the different among control, 7mg/1ml and 10mg/1ml were significant ($p < 0.05$) Treatment 5mg/1ml reduce growth but not significant but in *Helianthus annus* there was no significant difference between control and other concentration treatment but significant difference were not observe in 5mg/1ml, 7mg/1ml and 10mg/1ml. The result showed that 70% methanol extract of dried leaves had inhibitory effect on seed germination and growth of seedling of *Abelmoschus esculentus*

and *Helianthus annuus*. Our results were similar to reports of S.Ghasem, M. Ghasemi and N.Moradi (2011) and report of Al.Zahrani and Al-Robai (2007). In the studied plant, the greatest inhibitory effect was found in highest concentration of (10mg/1ml). Similar phytotoxic effects of many plant extracts have been reported. Extracts of different parts of this plant affect germination and seedling vigor of many crops (Oudhia and Tripathi, 2001). Channappagoudar et al., (2005) reported that the extracts of *Cyperus rotundus* and *Commelina bengalensis* had an inhibitory effect on germination and seedling length of wheat, green gram and soybean. Al-Zahrani and Al-Robai(2007) also showed extract of *Calotropis procera* had inhibitory effect on seed germination of *Senna occidentalis*. Kayode and Ayeeni (2009) showed aqueous extracts of sorghum stem and rice husks had allelopathic effects on the germination and growth of maize and the degree of inhibition depends on extract concentration. Similar results were obtained by Alsaadawi and Salih (2009), in which, they reported the root exudates of *C.rotundus* significantly reduced the root and shoot growth of tomato and cucumber plants. Tanveer et al., (2010); showed that the water extract of *Euphorbia helioscopia* L. reduced the germination percentage, seedling emergence and seedling vigor index in wheat, chickpea and lentil crops. Regarding treatment and treatment mode (TxM) interaction, the lowest germination percentage (7.0%) was found with the *Calotropis procera* extract applied to soil which remains significantly at par with that observed in Petri plate where *Calotropis procera* extract applied to sand. The highest germination percentage (60%) was found in Petri plate in which seed soaked with *C.procera* extract. Yasin M, M.E. Safdar, Z. Iqbal, A. Ali, K. Jabran, and A. Tanveer(2012) showed Phytotoxic Effect of *Calotropis procera* Extract on Germination and Seedling Vigor of wheat. KavithaD,

Prabhakaran J and Arumugam K(2012) reported phytotoxic effect of Purple nutsedge (*Cyperus rotundus*L.) on germination and growth of Finger millet (*Eleusine coracana Gaertn.*).

CONCLUSION

In general, it was concluded that extract of *Calligonum polygonoides* inhibit the germination and seedling growth of *Abelmoschus esculentus* and *Helianthus annuus* due to its phytotoxic effect but the phytotoxic effect of *Calligonum polygonoides* on *Hibiscus esculentus* is more significant than *Helianthus annuus* which was not more significant, although it also inhibits growth of radicle and plumule.

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Table 1. Radicle and Plumule Growth of *Helianthus annus* plant Treated by various Concentration of *Calligonum polygonoides* Extract

	Radicle Growth	Plumule Growth
Control	8mm	8mm
	2cm	2cm
	4cm	4cm
Mean	2.2cm	2.2cm
5mg/1ml	8mm	8mm
	1.5cm	1.5cm
	3.5cm	3.5cm
Mean	1.9cm	1.9cm
7mg/1ml	7mm	7mm
	1.3cm	1.3cm
	3.3cm	3.3cm
Mean	1.7cm	1.7cm
10mg/1ml	7mm	7mm
	1.2cm	1.2cm
	3.4cm	3.4cm
Mean	1.7cm	1.7cm

Table 2. Radicle and Plumule Growth of *Abelmoschus esculentus* (*Hibiscus esculentus*) plant Treated by various Concentration of *Calligonum polygonoides* Extract

	Radicle Growth	Plumule Growth
Control	.8mm	.8mm
	1.5cm	1.5cm
	3cm	3cm
Mean	1.7cm	1.7cm
5mg/1ml	.4mm	.4mm
	.8mm	.8mm
	1.5cm	1.5cm
Mean	.9mm	.9mm
7mg/1ml	3mm	3mm
	.7mm	.7cm
	1cm	1cm
Mean	.6mm	.6mm
10mg/1ml	0mm	0mm
	.5mm	1.5cm
	1cm	1.5cm
Mean	1cm	1cm

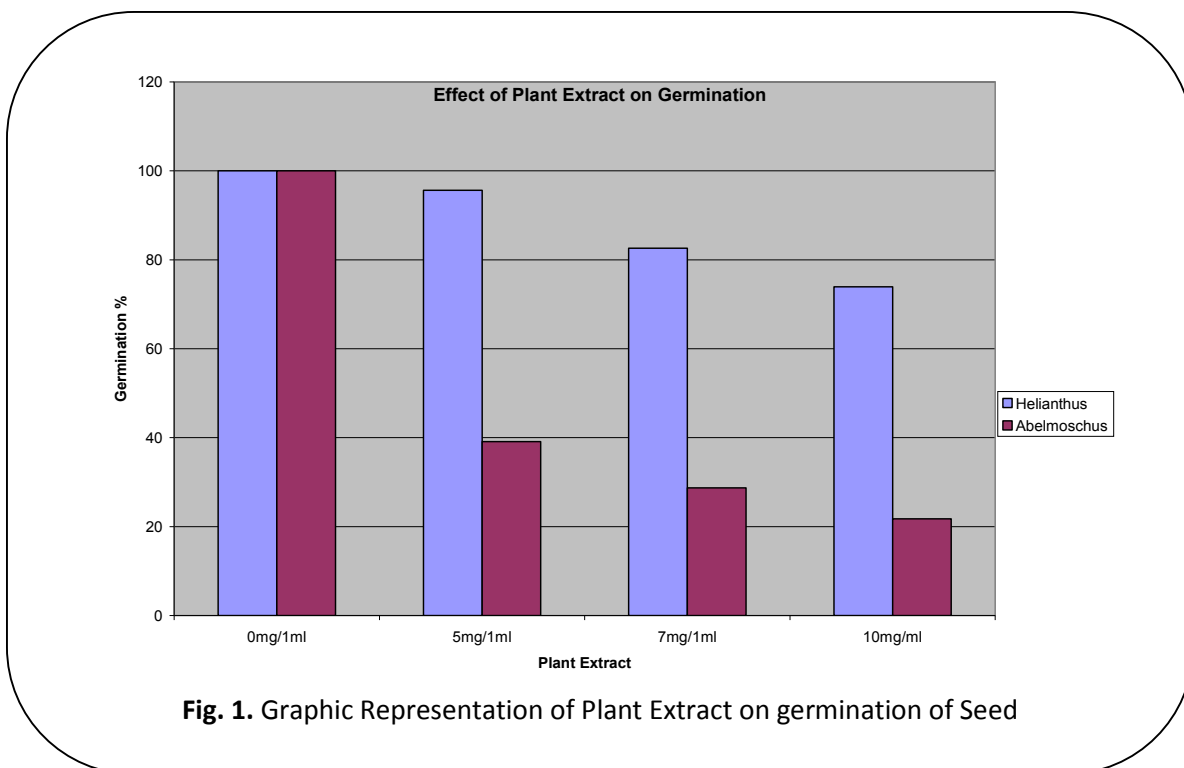


Fig. 1. Graphic Representation of Plant Extract on germination of Seed

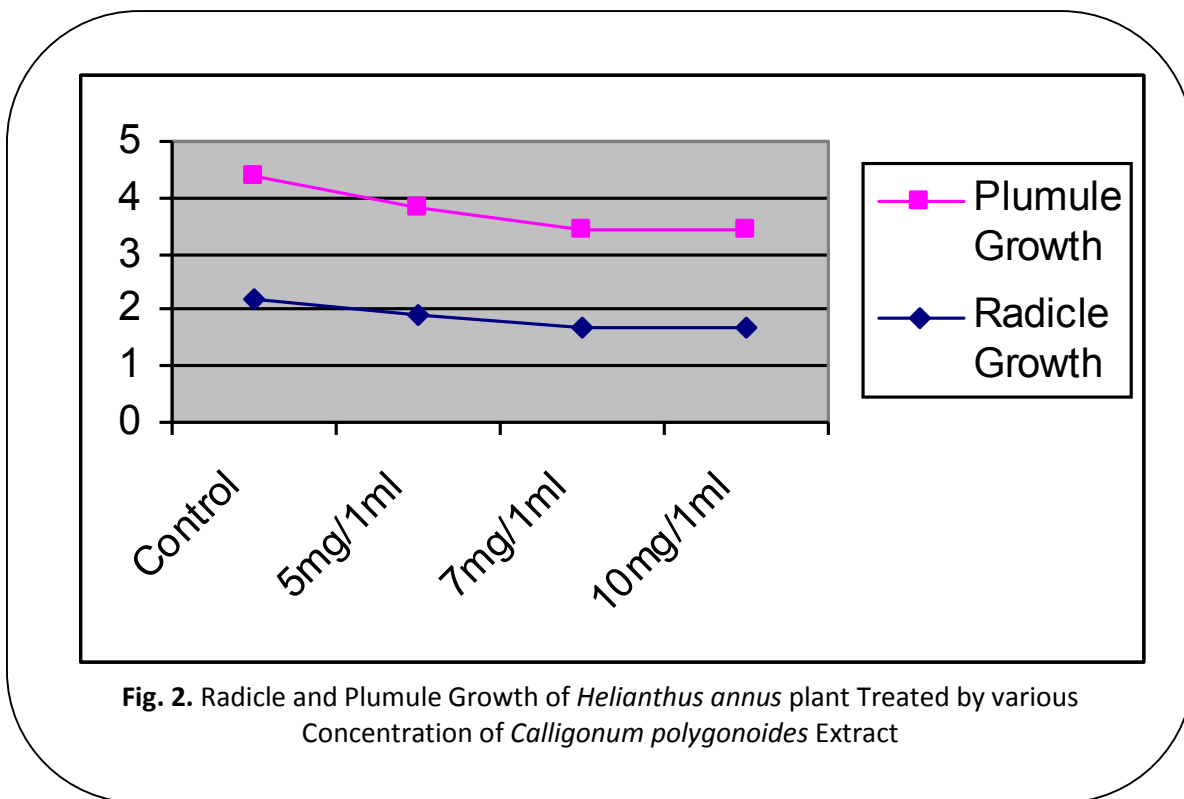


Fig. 2. Radicle and Plumule Growth of *Helianthus annuus* plant Treated by various Concentration of *Calligonum polygonoides* Extract

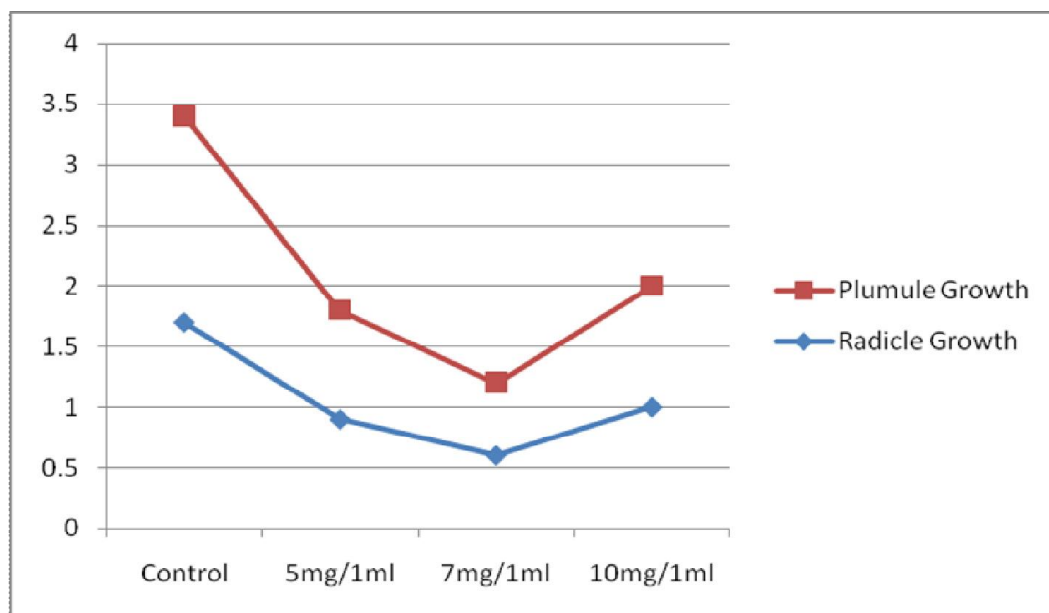


Fig. 3. Phytotoxic Effect of *Calligonum Polygonoides* Extracts on Germination of *Abielmoschus Esculentus* (*Hibiscus Esculentus*)