Research Article

Allelopathic effect of *Ficus carica* L. against *Triticum aestivum* L., *Zea mays* L., *Lactuca sativa* L. and *Trifolium repens* L.

Sher Zaman¹, Tabassum Yaseen^{2*}, Ali Mujtaba Shah³, Matiullah Khan⁴, Manzoor Ahmad⁵, Rani Gul⁵, Khushnood ur Rahman⁶ and Gul Nawaz²

1. Department of Botany, Government Post Graduate College, Charsadda, Khyber Pakhtunkhwa-Pakistan

2. Department of Botany, Bacha Khan University, Charsadda, Khyber Pakhtunkhwa-Pakistan

3. Department of Livestock Production, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand-67210, Sindh-Pakistan

4. Land Resources Research Program (LRRP) NARC, Islamabad-Pakistan

5. Department of Agriculture, Bacha Khan University, Charsadda, Khyber Pakhtunkhwa-Pakistan

6. Department of Botany, Islamia College, Peshawar, Khyber Pakhtunkhwa-Pakistan

*Corresponding author's email: tabassumyaseenbkuc@gmail.com

Citation

Sher Zaman, Tabassum Yaseen, Ali Mujtaba Shah, Matiullah Khan, Manzoor Ahmad, Rani Gul, Khushnood ur Rahman and Gul Nawaz. Allelopathic effect of *Ficus carica* L. against *Triticum aestivum* L., *Zea mays* L., *Lactuca sativa* L. and *Trifolium repens* L. Pure and Applied Biology. Vol. 10, Issue 1, pp1-11.

<http://dx.doi.org/10.19045/bspab.2021.100001>

Received: 05/05/2020

Revised: 05/08/2020

Accepted: 10/08/2020

Online First: 26/08/2020

Abstract

The current study was conducted with the aim to test the allelopathic influence of *Ficus carica* L. against four different crop species i.e. *Triticum aestivum* L., *Zea mays* L., *Lactuca sativa* L., *Trifolium repens* L. the plant parts i.e. leaves and bark were collected and shade dried at room temperature. The data were recorded in term of percent germination, radicle and plumule length, fresh and dry weight and moisture contents of the species. The maximum inhibitions were recorded for higher concentration 10gm/100ml at longer soaking duration 72 hrs. Bark showed robust potential as compared with leaves. The highest reduction in term of germination was recorded as (57.89%, 56.57%, 46.77%) and (38.57%) for higher concentration 10gm/100ml at longer soaking duration 72 hrs. In *T. repens*, *T. aestivum*, *L. sativa* and *Z. mays* respectively. In case of radicle and plumule length the same concentration a same soaking duration showed (76.84%, 75.24%, 63.98%) and (81.18%) and (81.30, 75.84, 62.82) and (74.49) in *T. aestivum*, *Z. mays*, *L. sativa* and *T. repens* respectively. In term of fresh and dry weight the reduction was recorded as (82.73, 78.06, 53.16%) and (18.92%) and (69.13%, 52.48%, 35.44%) and (28.60%) in *T. repens*, *L. sativa*, *T. aestivum* and *Z. mays* respectively. The robust inhibition was recorded for moisture content as (71.45%, 52.39%, 36.08%) and (30.27%) in *T. repens*, *L. sativa*, *T. aestivum* and *Z. mays* respectively. The results concluded that certain compounds present in the plant which required further explorations for the isolation of active ingredients which may triggered inhibition.

Keywords: Allelopathy, *Ficus carica* L., *Lactuca sativa* L., *Triticum aestivum* L., *Trifolium repens* L. and *Zea mays* L.

Introduction

Allelopathy is an interference mechanism in which living or dead plants release

allelochemicals exerting an effect (mostly negative) on the associated plants, and can play an important role in natural

ecosystems [1, 2]. The term allelopathy, derived from the Greek words 'allelon' meaning 'each other' and 'pathos' meaning 'suffering' and this term was coined by plant physiologist [3]. Many aspects of plant ecology including the dominance, succession, diversity and structure of plant community can be affected by allelopathy [4, 5]. After Prof. Hans Molisch coined the word 'allelopathy' in 1937, efforts have been made to explore the allelopathic potential of various plant species [6]. The concept of allelopathy was further supported and further developed by many scientists which include Bonner, Grummer and Beyer, Evenari, Whittaker, Pitman and Duke, Fischer and others [7]. In 1974, after the publication of the first book in English on allelopathy by Elroy L. Rice the concept of allelopathy received new attention [3]. Allelopathy is a natural technique that may be considered as a tool for biological weed control. When sensitive plants are exposed to allelochemicals, germination, growth and development of the plants are affected. If we understand the mechanisms of allelopathic interactions, we can put allelochemicals to work for the benefit of agriculture [8]. Chemicals that are released from plants which impose allelopathic influence on other plants are called allelochemicals or allelochemics [9]. Allelochemicals are defined as Bio communicators, suggesting the possibility of active mixtures, because of the increasing the number of findings in which single compound are not active or are not as active as mixture [10]. Chemically allelochemical compounds have open chain molecular structures and these are secondary metabolites that have role in plant-plant, plant-soil, plant disease, plant-insect and plant predator interactions that may be beneficial or detrimental to plant [11]. Allelochemicals are believed to be a joint action of several secondary metabolites including phenolic compounds, flavonoids, juglone (quinine), terpenoids and non-protein amino acids like alkaloids [12]. Phytochemical studies revealed the

presence of numerous bioactive compounds i.e. arabinose, -amyrins, -carotenes, glycoAbsides, -sterosterols and xanthotoxol [13]. Therefor the study was conducted in order to evaluate the potential of extract of leaves and bark of *Ficus carica* against certain crop species i.e. *Triticum aestivum* L., *Zea mays* L., *Lactuca sativa* and *Trifolium repens* L.

Materials and Methods

The *Ficus carica* L. were collected and shade dried under room temperature (25-30°C). The dried parts of plant were grinded into fine powders. The grinded powders were soaked for different duration i.e. 24 hrs. 48 hrs. and 72 hrs. in amount of 5gm/100ml and 10gm/100ml to make two different concentrations from each part. The hot water extract of each part were also obtained through shaking of powder in hot water in same amount. The certified seed were obtained from authorized dealer and used in the aqueous extract experiments were performed using filter paper bioassay. For the control distilled water were used. The data of the aqueous extract were recorded after 72 hrs of duration. In order to explore the potential of plant the mulching and litter experiments were also performed in the pot bioassay. For the mulching 10gm powder of each part were used and the same data were recorded after seven days of germination whereas in the litter the single filter paper were used in the Petri plates above the 10gm mixed powder of both the parts and were moistened with distilled water for the control the double filter paper were used in empty petri plates both treatment and control experiments were performed in replicate form five replicates were used for each treatments. All the data i.e. percent germination, radicle and plumule length, fresh and dry weight and moisture contents data were recorded and were analyzed through ANNOVA.

Results and Discussion

The percent germination of the test crop species was recorded which showed that all the species were significantly inhibited. The maximum inhibition was recorded for

the bark extract at higher concentration 10gm/ml at longer duration 72 hrs as compared to leaf (Fig. 1, 2, 3 & 4). The manner of inhibition was *T. repens* followed by, *T. aestivum*, *L. sativa* and *Z. mays* i.e. (57.89%), (56.57%, 46.77%) and (38.57%) respectively (Table 1). Whereas the same concentration at same soaking duration of leaf showed (41.66%, 34.76%, 26.24%) and (19.66%) inhibition in *T. repens*, *T. aestivum*, *Z. mays* and *L. sativa* respectively (Fig. 5, 6 & 7) our result agree with the [14]. Higher concentration 10gm/100ml of bark and leaf extract showed significant inhibition whereas lower concentration 5gm/100ml of both showed non-significant inhibition (Table 1) our result supported by recorded by [15]. The length of the radical was also being significantly reduced at all concentrations the same manner of inhibition was recorded in radical length also i.e. higher concentration 10gm/100ml showed maximum inhibition whereas lower concentration at same duration caused less reduction (Table 2). The leaf extract showed less i.e. (60.02%, 62.33%, 49.78%) and (73.34%) whereas bark showed highest reduction (76.84%, 75.24%, 63.98%) and (81.18%) in radical length of *T. aestivum*, *Z. mays*, *L. sativa* and *T. repens* respectively. The length of plumule was also be recorded as significantly inhibited by all the treatments (Table 2) our result supported by recorded by [16]. Same concentration at same duration showed maximum and minimum inhibition i.e. leaf at higher concentration 10gm/100ml at longer duration 72 hrs. showed (70.92%, 62.73%, 47.52%) and (59.35%) inhibition whereas bark at same concentration and duration showed (81.30%, 75.84%, 62.82%) and (74.49%) inhibition in plumule length of *T. aestivum*, *Z. mays*, *L. sativa* and *T. repens* respectively. Both the leaf and bark 5gm/100 hot extract showed non-significant inhibition (Fig. 8 & 9) whereas higher concentration 10gm/100ml of both leaf and bark hot water extract

showed significant inhibition in both radicle and plumule length (Fig. 10).

In case of fresh and dry weight all the treatment also showed significant manner of inhibition the manner of inhibition was recorded as *T. repens* followed by *L. sativa*, *T. aestivum* and *Z. mays*. The highest reduction showed by the bark extract followed by leaves whereas in comparison of concentration the higher concentration showed highest inhibition as compared to lower concentration at longer soaking duration i.e. the bark extract of higher concentration 10gm/100ml at longer duration 72 hrs. showed 82.73%, 78.06%, 53.16% and 18.92% in dry weight of *T. repens*, *L. sativa*, *T. aestivum* and *Z. mays* whereas fresh weight inhibition was recorded as (69.13%, 52.48%, 35.44%) and (28.60%) respectively for 10gm/100ml at higher soaking duration 72 hrs (Table 3) our result supported by recorded by [17]. However, the same concentration at same soaking duration leaf extract showed (77.58%, 62.15%, 38.82%) and (12.98%) inhibition in dry weight whereas in fresh weight it showed (58.94%, 34.95%, 23.40%) and (18.58%) inhibitions in *T. repens*, *L. sativa*, *T. aestivum* and *Z. mays* (Table 3). Hot water extract also showed inhibition but the highest inhibition showed by bark at higher concentration 10gm/100ml. The moisture contents data was also recorded which also denoted the same type of inhibitions as denoted for weight i.e. the bark extract of higher concentration 10gm/100ml at longer duration 72hrs showed highest inhibition (71.45%, 52.39%, 36.08% and 30.27%) in *T. repens*, *L. sativa*, *T. aestivum* and *Z. mays* (Table 4). our result supported by recorded by [14, 16]. Mulching and litter experiments also proven to be inhibitory against all the parameter used in the investigations of the test crop species (Fig. 11 & 12) but the maximum activity was recorded for bark followed by leaves (Table 5) which were also recorded by [18].

Figure 1. Impact of aqueous extract of *Ficus carica* (bark and leaf) 10g on *Triticum aestivum*. (a and b: Control effect c and d: Test effect)

Figure 2. Impact of aqueous extract (10g leaf and bark) of *Ficus carica* on *Zea mays* (a and b: Control effect c and d: Test effect)

Figure 3. Impact of aqueous extract of *Ficus carica* (bark and leaf) 10g on *Lactuca sativa*. (a and b: Control effect c and d: Test effect)

Figure 4. Impact of aqueous extract of *Ficus carica* (bark and leaf) 10g on *Trifolium repense*. (a and b: Control effect c and d: Test effect)

Figure 5. Impact of aqueous extract (5g leaf and bark) on *Zea mays* (a and b: Control effect c and d: Test effect)

Figure 6. Impact of aqueous extract of *Ficus carica* (bark and leaf) 5g on *Lactuca sativa*. (a and b: Control effect c and d: Test effect)

Figure 7. Impact of aqueous extract of *Ficus carica* (bark and leaf) 5g on *Trifolium repense*. (a and b: Control effect c and d: Test effect)

Figure 8. Impact of hot water extract (5g leaf and bark) of *Ficus carica* on *Triticum aestivum* (a and b: Control effect c and d: Test effect)

Figure 9. Impact of hot water extract of *Ficus carica* (bark and leaf) 5g on *Trifolium repense*. (a and b: Control effect c and d: Test effect)

Figure 10. Impact of hot water extracts (5g leaf and bark) of *Ficus carica* on *Zea mays* (a and b: Control effect c and d: Test effect)

Figure 11. Impact of Litter on *Triticum aestivum*. (a and c: Control effect b and d: Test effect)

Figure 12. Impact of Litter on *Trifolium repense*. (a and c: Control effect b and d: Test effect)

Table 1. Effect of both cold and hot aqueous extract of *Ficus carica* L. on the germination of four test crop species, and the number of seminal roots of wheat and *Zea mays*

Treatments	Test species				Seminal roots number	
	<i>Triticum aestivum</i> L.	<i>Zea mays</i> L.	<i>Lactuca sativa</i> L.	<i>Trifolium repens</i> L.	<i>Triticum aestivum</i> L.	<i>Zea mays</i> L.
Control	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00	7.65±0.48	7.54±0.54
5gm/24hrs. leaf	71.36±0.38*	85.47±0.78*	86.33±0.59*	68.38±0.23*	4.96±0.23*	4.12±0.21*
5gm/48hrs. leaf	70.96±0.68*	82.14±0.35*	84.67±0.79*	65.34±0.46*	4.34±0.58*	4.09±0.58*
5gm/72hrs. leaf	69.48±0.32*	76.88±0.78*	84.57±0.23*	64.78±0.23*	4.11±0.99*	4.00±0.43*
10gm/24hrs. leaf	68.95±0.54*	76.67±0.34*	82.76±0.33*	61.76±0.88*	4.09±0.22*	3.86±0.21*
10gm/48hrs. leaf	68.65±0.75*	74.54±0.65*	82.54±0.78*	60.54±0.33*	4.02±0.88*	3.86±0.69*
10gm/72hrs. leaf	65.24±0.23*	73.76±0.23*	80.34±0.33*	58.34±0.78*	3.98±0.22*	3.74±0.58*
5gm/24hrs. bark	64.23±0.45*	73.23±0.24*	79.34±0.44*	56.23±0.69*	3.53±0.25*	3.65±0.23*
5gm/48hrs. bark	60.32±0.78*	70.93±0.76*	67.44±0.65*	51.57±0.35*	3.43±0.59*	3.43±0.88*
5gm/72hrs. bark	57.38±0.24*	69.43±0.79*	63.22±0.63*	47.28±0.75*	3.11±0.68*	3.23±0.43*
10gm/24hrs. bark	54.89±0.76*	66.68±0.76*	61.68±0.77*	45.23±0.23*	3.04±0.22*	3.19±0.64*
10gm/48hrs. bark	51.65±0.22*	64.45±0.33*	56.34±0.97*	43.24±0.77*	3.00±0.77*	3.09±0.74*
10gm/72hrs. bark	43.43±0.05*	61.43±0.45*	53.23±0.44*	42.11±0.23*	2.98±0.23*	3.00±0.33*
5ggm/100ml. hot leaf	93.24±0.23 ^{Ns}	94.65±0.34 ^{Ns}	95.33±0.56 ^{Ns}	78.11±0.99*	7.17±0.39 ^{Ns}	7.32±0.75 ^{Ns}
10gm/100ml. hot leaf	73.88±0.99*	78.46±0.22*	79.68±0.34*	70.32±0.44*	3.10±0.53*	4.34±0.34*
10gm/100ml. hot bark	92.26±0.89 ^{Ns}	91.83±0.24 ^{Ns}	93.42±0.79 ^{Ns}	75.86±0.23*	6.73±0.22 ^{Ns}	7.13±0.58 ^{Ns}
5gm/100ml. hot bark	71.45±0.23*	73.44±0.55*	76.47±0.59*	70.00±0.54*	3.05±0.69*	4.08±0.23*
Leaves mulch					4.12±0.45*	4.67±0.65*
Bark mulch					3.26±0.68*	3.87±0.33*
Litter					3.21±0.21*	3.45±0.48*

The treatments were made and the mentioned data were recorded from five replicates. Each the mentioned value is the grand mean and standard error of five replicates each having ten seeds. Ns= non-significant, *= significant at $\alpha > 0.05$

Table 2. Effect of both cold and hot aqueous extract of *Ficus carica* L. on the radicle and plumule length of four test crop species

Treatments	Test species							
	<i>Triticum aestivum</i> L.		<i>Zea mays</i> L.		<i>Lactuca sativa</i> L.		<i>Trifolium repens</i> L.	
	Radicle	Plumule	Radicle	Plumule	Radicle	Plumule	Radicle	Plumule
Control	12.48±0.58	10.59±0.67	11.23±0.39	09.23±0.69	13.88±0.54	09.28±0.68	08.29±0.75	07.33±0.25
5gm/24hrs. leaf	07.45±0.54*	5.45±0.23*	06.65±0.76*	05.45±0.33*	08.76±0.87*	06.76±0.23*	04.21±0.88*	04.68±0.43*
5gm/48hrs. leaf	07.32±0.56*	4.23±0.34*	05.34±0.34*	04.32±0.45*	08.32±0.34*	06.34±0.54*	03.66±0.33*	04.65±0.77*
5gm/72hrs. leaf	06.76±0.86*	3.87±0.23*	05.21±0.86*	04.12±0.76*	07.76±0.32*	06.22±0.75*	03.34±0.89*	03.23±0.98*
10gm/24hrs. leaf	05.36±0.28*	03.23±0.43*	04.67±0.46*	03.87±0.35*	07.56±0.69*	05.09±0.69*	02.43±0.98*	03.10±0.44*
10gm/48hrs. leaf	05.23±0.63*	03.18±0.44*	04.34±0.69*	03.54±0.44*	07.34±0.87*	05.02±0.24*	02.26±0.24*	03.02±0.78*
10gm/72hrs. leaf	04.99±0.22*	03.08±0.23*	04.23±0.23*	03.44±0.69*	06.97±0.23*	04.87±0.69*	02.21±0.43*	02.98±0.35*
5gm/24hrs. bark	04.68±0.89*	02.89±0.88*	04.12±0.79*	03.21±0.35*	06.45±0.94*	04.56±0.23*	02.15±0.69*	02.85±0.69*
5gm/48hrs. bark	04.09±0.49*	02.67±0.98*	03.98±0.48*	03.09±0.49*	06.34±0.33*	04.34±0.44*	02.09±0.26*	02.54±0.79*
5gm/72hrs. bark	03.68±0.37*	02.23±0.47*	03.54±0.99*	02.87±0.68*	05.45±0.68*	04.13±0.23*	01.99±0.68*	02.24±0.38*
10gm/24hrs. bark	03.54±0.32*	02.16±0.34*	03.34±0.23*	02.67±0.87*	05.24±0.43*	03.98±0.32*	01.92±0.34*	02.13±0.32*
10gm/48hrs. bark	03.43±0.65*	02.13±0.23*	03.21±0.75*	02.45±0.32*	05.14±0.56*	03.68±0.76*	01.87±0.22*	02.08±0.79*
10gm/72hrs. bark	02.89±0.75*	01.98±0.65*	02.78±0.12*	02.23±0.32*	05.00±0.23*	03.45±0.86*	01.56±0.79*	01.87±0.33*
5ggm/100ml.hot leaf	11.98±0.78 ^{Ns}	09.06±0.34 ^{Ns}	10.98±0.34 ^{Ns}	08.93±0.78 ^{Ns}	12.90±0.58 ^{Ns}	09.02±0.94 ^{Ns}	07.12±0.79 ^{Ns}	07.01±0.25 ^{Ns}
10gm/100ml. hot leaf	04.56±0.59*	03.89±0.38*	05.67±0.33*	03.97±0.43*	07.86±0.23*	06.23±0.25*	04.08±0.36*	04.94±0.78*
10gm/100ml. hot bark	11.32±0.23 ^{Ns}	09.19±0.64 ^{Ns}	10.08±0.48 ^{Ns}	08.94±0.93 ^{Ns}	12.88±0.29 ^{Ns}	09.00±0.12 ^{Ns}	07.02±0.65 ^{Ns}	07.00±0.79 ^{Ns}
5gm/100ml. hot bark	03.79±0.28*	03.57±0.67*	05.35±0.23*	03.86±0.78*	07.49±0.79*	06.12±0.59*	04.00±0.78*	04.87±0.23*

The treatments were made and the mentioned data were recorded from five replicates. Each the mentioned value is the grand mean and standard error of five replicates each having ten seeds. Ns= non-significant, *= significant at $\alpha > 0.05$

Table 3. Effect of both cold and hot aqueous extract of *Ficus carica* L. on the fresh and dry weight of four test crop species

Treatments	Test species							
	<i>Triticum aestivum</i> L.		<i>Zea mays</i> L.		<i>Lactuca sativa</i> L.		<i>Trifolium repens</i> L.	
	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight	Fresh weight	Dry weight
5gm/24hrs. leaf	80.55±0.21*	70.13±0.46*	87.49±0.12*	98.43±0.23 ^{Ns}	79.01±0.44*	52.69±0.32*	50.81±0.45*	28.09±0.43*
5gm/48hrs. leaf	80.16±0.48*	68.82±0.22*	86.95±0.58*	96.22±0.34 ^{Ns}	75.43±0.68*	50.11±0.58*	47.42±0.14*	26.29±0.68*
5gm/72hrs. leaf	79.07±0.12*	67.24±0.58*	86.40±0.21*	93.74±0.57 ^{Ns}	71.86±0.32*	47.10±0.87*	45.64±0.43*	25.26±0.23*
10gm/24hrs. leaf	78.87±0.98*	60.26±0.47*	84.40±0.57*	90.93±0.76 ^{Ns}	70.24±0.58*	44.09±0.65*	44.46±0.54*	24.48±0.54*
10gm/48hrs. leaf	78.78±0.34*	64.08±0.87*	82.01±0.33*	87.80±0.23*	67.70±0.62*	42.58±0.88*	43.87±0.49*	22.68±0.44*
10gm/72hrs. leaf	76.60±0.67*	61.18±0.32*	81.42±0.67*	87.02±0.56*	65.05±0.98*	37.85±0.23*	41.06±0.78*	22.42±0.57*
5gm/24hrs. bark	75.52±0.32*	59.87±0.68*	79.12±0.44*	82.65±0.23*	61.36±0.33*	33.55±0.67*	36.19±0.65*	21.91±0.61*
5gm/48hrs. bark	73.25±0.67*	57.11±0.23*	76.98±0.54*	80.50±0.88*	60.21±0.56*	30.75±0.46*	34.56±0.23*	21.65±0.32*
5gm/72hrs. bark	72.46±0.33*	55.53±0.98*	75.88±0.23*	79.78±0.76*	58.71±0.67*	26.45±0.12*	32.94±0.56*	20.62±0.43*
10gm/24hrs. bark	70.19±0.12*	53.82±0.23*	75.19±0.68*	78.86±0.73*	56.29±0.23*	23.87±0.57*	32.50±0.68*	19.59±0.68*
10gm/48hrs. bark	67.92±0.57*	49.47±0.99*	72.45±0.86*	81.93±0.46*	52.60±0.47*	23.44±0.58*	31.91±0.96*	18.81±0.22*
10gm/72hrs. bark	64.56±0.44*	46.84±0.12*	71.40±0.43*	81.08±0.34*	47.52±0.23*	21.94±0.43*	30.87±0.43*	17.27±0.58*
5ggm/100ml.hot leaf	79.86±0.64*	68.29±0.58*	87.49±0.12*	94.13±0.67 ^{Ns}	75.43±0.68*	50.32±0.11*	45.79±0.32*	26.03±0.67*
10gm/100ml. hot leaf	77.79±0.68*	66.84±0.87*	85.25±0.96*	92.82±0.56 ^{Ns}	70.70±0.37*	43.44±0.57*	44.02±0.54*	25.26±0.33*
5gm/100ml. hot bark	72.46±0.98*	64.21±0.12*	83.41±0.46*	90.87±0.49 ^{Ns}	67.82±0.68*	35.91±0.68*	29.99±0.34*	17.27±0.87*
10gm/100ml. hot bark	70.29±0.32*	55.66±0.57*	81.91±0.89*	90.48±0.22 ^{Ns}	62.98±0.57*	31.18±0.43*	29.25±0.57*	14.43±0.12*

The treatments were made and the mentioned data were recorded from five replicates. Each the mentioned value is the grand mean and standard error of five replicates each having ten seeds. Ns= non-significant, *= significant at $\alpha > 0.05$

Table 4. Effect of both cold and hot aqueous extract of *Ficus carica* L. on the moisture contents of four test crop species

Treatments	Test species moisture			
	<i>Triticum aestivum</i> L.	<i>Zea mays</i> L.	<i>Lactuca sativa</i> L.	<i>Trifolium repens</i> L.
5gm/24hrs. leaf	80.03±0.68*	86.50±0.12*	79.82±0.23*	50.40±0.89*
5gm/48hrs. leaf	79.70±0.44*	86.01±0.34*	76.03±0.58*	46.67±0.57*
5gm/72hrs. leaf	78.59±0.94*	85.52±0.68*	72.27±0.21*	44.74±0.58*
10gm/24hrs. leaf	79.07±0.32*	83.48±0.54*	70.74±0.48*	43.48±0.23*
10gm/48hrs. leaf	78.57±0.68*	81.02±0.34*	68.02±0.32*	43.15±0.57*
10gm/72hrs. leaf	76.34±0.23*	80.41±0.67*	65.50±0.68*	39.81±0.33*
5gm/24hrs. bark	75.22±0.96*	78.12±0.12*	61.80±0.67*	33.94±0.87*
5gm/48hrs. bark	72.87±0.22*	75.89±0.34*	60.81±0.34*	31.97±0.78*
5gm/72hrs. bark	72.12±0.58*	74.73±0.43*	59.61±0.64*	30.20±0.56*
10gm/24hrs. bark	69.67±0.64*	74.01±0.49*	57.20±0.78*	29.93±0.34*
10gm/48hrs. bark	67.52±0.35*	70.84±0.67*	53.12±0.88*	29.40±0.58*
10gm/72hrs. bark	63.92±0.68*	69.73±0.12*	47.61±0.82*	28.55±0.12*
5ggm/100ml.hot leaf	79.41±0.88*	86.70±0.21*	76.01±0.23*	44.77±0.32*
10gm/100ml. hot leaf	77.14±0.72*	84.32±0.68*	71.31±0.56*	42.78±0.67*
5gm/100ml. hot bark	71.16±0.28*	82.40±0.23*	68.80±0.12*	27.43±0.56*
10gm/100ml. hot bark	69.57±0.58*	80.78±0.68*	63.86±0.65*	27.39±0.54*

The treatments were made and the mentioned data were recorded from five replicates. Each the mentioned value is the grand mean and standard error of five replicates each having ten seeds. Ns= non-significant, *= significant at $\alpha > 0.05$

Table 5. Effect of both mulching and litter of *Ficus carica* L. on all the parameter of four test crop species

Mulching effect					Litter effect			
Parts	<i>Triticum aestivum</i> L.	<i>Zea mays</i> L.	<i>Lactuca sativa</i> L.	<i>Trifolium repens</i> L.	<i>Triticum aestivum</i> L.	<i>Zea mays</i> L.	<i>Lactuca sativa</i> L.	<i>Trifolium repens</i> L.
Germination (% control)								
Bark	65.6±2.48*	53.4±2.34*	44.0±1.41*	64.8±1.98*	61.11±0.35*	44.24±0.99*	51.45±0.23*	41.80±0.86*
Leaves	48.8±2.48*	60.8±1.98*	30.4±1.36*	71.4±2.48*				
Radicle length (% control)								
Bark	71.20±2.58*	84.18±0.66*	60.38±1.34*	76.72±1.28*	64.71±0.21*	76.47±0.12*	61.76±0.12*	70.59±0.98*
Leaves	69.0±1.28*	77.3±1.60*	51.9±1.00*	76.9±1.21*				
Plumule length (% control)								
Bark	86.2±0.86*	83.99±0.65*	71.95±1.86*	81.0±1.56*	61.29±0.85*	74.19±0.45*	58.06±0.77*	80.65±0.34*
Leaves	67.2±1.55*	37.44±1.03*	37.5±1.82*	78.6±1.21*				
Fresh weight (% control)								
Bark	79.6±1.55*	79.0±1.51*	83.5±1.11*	90.0±1.18*	69.64±0.22*	70.52±0.86*	65.79±0.44*	59.35±0.57*
Leaves	82.6±1.40*	76.6±1.36*	84.2±1.02*	88.1±1.46*				
Dry weight (% control)								
Bark	50.9±0.51*	51.5±1.08*	82.7±1.16*	71.9±1.84*	71.80±0.87*	87.25±0.64*	65.92±0.13*	46.14±0.33*
Leaves	62.5±1.38*	53.1±1.36*	74.4±1.56*	66.9±1.96*				
Moisture contents (% control)								
Bark	16.2±3.44*	15.5±3.00*	7.8±0.58*	14.8±4.28*	47.18±0.54*	34.82±0.66*	42.70±0.57*	47.02±0.11*
Leaves	13.0±4.38*	12.6±0.77*	13.2±2.62*	15.7±3.85*				

The treatments were made and the mentioned data were recorded from five replicates. Each the mentioned value is the grand mean and standard error of five replicates each having ten seeds. Ns= non-significant, *= significant at $\alpha > 0$

Conclusion

The present study propose the presence of various allelo-chemicals in hot water and cold water aqueous extracts, litter and mulch of *Ficus carica* that revealed allelopathic stress against the germination, fresh and dry weight, radical length, plumule length, moisture contents and germination of tested species. It was also revealed that different parts of the same plant had differential toxicity against the different test varieties. Toxic effect also varies against the various growth parameters i.e. germination, fresh and dry weight, radical length, plumule length, moisture contents and germination of tested species. Toxic effect of test species increase with increasing concentration i.e. 5 grams to 10 grams and 24 to 72 hours soaking durations. Hot water extract was more toxic than aqueous extract that might be due to increase virulence of allelochemicals of test species on tested species. Leaf of test plant was observed more harmful than bark at least in the present species, might be due to toxic allelochemicals. The findings of this study showed that the breeders should choose experimental plant as weedicide to control weeds.

Authors' contributions

Conceived and designed the experiments: S Zaman & T Yaseen, Performed the experiments: S Zaman, Analyzed the data: S Zaman, Contributed materials/ analysis/ tools: S Zaman, AM Shah, M Khan, M Ahmad R Gul, K Rahman & G Nawaz, Wrote the paper: S Zaman.

Acknowledgement

This research work is the partial part of M.Phil. Thesis of Scholar Mr. Sher Zaman.

References

- Ahmad N & Bano (2013). Impact of allelopathic potential of maize (*Zea mays* L.) on physiology and growth of soybean [*Glycine max* (L.) merr.]. *Pak J Bot* 45(4): 1187-1192.
- Hane EN, Hamburg SP, Barber AL & Plaut JA (2003). Phytotoxicity of American beech leaf leachate to sugar maple seedlings in a greenhouse experiment. *Can J For Res* 33: 814-821.
- Bhadoria PBS (2011). Allelopathy: A natural way towards weeds management. *Am J Exp Agric* 1(1): 7-20.
- Cheng F & Cheng Z (2015). Research progress on the use of plant allelopathy in agriculture and the physiological and ecological mechanisms of allelopathy. *Front in Plant Sci* 6: 1020.
- Cheng F & Cheng Z (2016). Corrigendum: research progress on the use of plant allelopathy in agriculture and the physiological and ecological mechanisms of allelopathy. *Front in Plant Sci* 7: 1697.
- Khan AL, Hussain J, Hamayun M, Shinwari ZK, Khan H, Young-Hwa K & In-Jung L (2009). Profile and allelopathic effect of endemic *Inula koelzii* from Himalaya Pakistan. *Pak J Bot* 41(5): 2517-2527.
- Sisodia S & Siddiqui MB (2010). Allelopathic effect by aqueous extracts of different parts of *Croton Bonplandianum* Baill. On some crop and weed plants. *J of Agric Extension and Rural Dev* 2(1): 022-028.
- Yazdani M & Bagheri H (2011). Allelopathic effect of Tobacco (*Nicotiana tabacum* L.) on germination and early growth of Soyabean (*Glycine max* L.). *Aust J Basic & Appl Sci* 5(11): 1178-1181.
- Oyerinde RO, Otusanya OO & Akpor OB (2009). Allelopathic effect of *Tithonia diversifolia* on the germination, growth and chlorophyll contents of maize (*Zea mays* L.). *Sci Res Es* 4(12): 1553-1558.
- Shruthi HR, Kumar NKH & Jagannath S (2014). Allelopathic potentialities of *Azadirachta indica* A. Juss. Aqueous leaf extract on early seed growth and biochemical parameters of *Vigna radiate* (L.) wilczek. *Int J Lat Res Sci Tech* 3(3): 109-115.
- Khan MA, Hussain I & Khan EA (2017). Allelopathic effects of

- Eucalyptus (*Eucalyptus camaldulensis* L.) on germination and seedling growth of wheat (*Triticum aestivum* L.). *Pak J W Sci Res* 14(1-2): 9-18.
12. Al-Watban A & Salama HMH (2012). Physiological effects of allelopathic activity of *Artemisia monosperma* on common bean (*Phaseolus vulgaris* L.). *Int Res J of Plant Sci* 3(8): 158-163.
 13. Duke JA (1992). Hand book of Phytochemical Constituents of GRAS Herbs and Other Economic Plants. CRC Press, Boca Raton, USA. pp. 117–118.
 14. Hussain F, Ahmad B & Ilahi I (2010). Allelopathic effects of *Cenchrus ciliaris* L. and *Bothriochloa pertusa* (L.) A. Camus. *Pak J Bot* 42(5): 3587-3604.
 15. Samreen U, Hussain F & Sher Z (2009). Allelopathic potential of *Calotropis procera* (Ait.). *Pak J Pl Sci* 15: 7-14.
 16. Barkatullah, Hussain F & Ibrar M (2010). Allelopathic potential of *Dodonaea viscosa* (L.) Jacq. *Pak J Bot* 42(4): 2383-2390.
 18. Poulin RX, Poulson-Ellestad KL, Roy JS & Kubanek J (2018). Variable allelopathy among phytoplankton reflected in red tide metabolome. *Harmful Algae* 71: 50-56.