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MANAGEMENT OF CHENOPODIUM ALBUM L. THROUGH ALLELOPATHY

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Abstract:-

The aim of the up to date study was to hold out evaluation of the allelopathic activity of leaves and bark of mulberry (Morus alba L.) on germination processes and a few growth parameters of the foremost problematic weeds in maize (Zea mays L.) fields; herb (Chenopodium album L). The investigator hopes that the study can provide data regarding the chances of mistreatment the target species as bioherbicides. In pure culture, the germination percentage (GP) of maize seeds was inefficaciously decreasing with increasing the concentrations of Morus alba leaves ***(MALAE)*** *and bark* ***(MABAE)*** *aqueous extracts whereas the germination percentage (GP) was considerably attenuated with increasing the concentrations of* ***MALAE*** *and* ***MABAE*** *in mixed culture with wild spinach. Similarly, in pure and mixed culture with Indian corn the doc of wild spinach seeds significantly attenuated with increasing the concentrations of* ***MALAE*** *and* ***MABAE.*** *Accordingly, the inhibition percentage (IP) for the germination processes in Zea seeds in pure culture wasn't vital in response to the apparent allelopathic action of the 2 applied extracts. The proportion was considerably multiplied with increasing the concentrations of* ***MALAE*** *and* ***MABAE*** *in mixed culture with Chenopodium album. Similarly, in pure and mixed culture with Zea mays the (IP) of Chenopodium album seeds significantly multiplied with increasing the concentrations of* ***MALAE*** *and* ***MABAE.***

Keywords:- *Mulberry, maize, goosefoot, germination percentage, inhibition percentage.*

INTRODUCTION:

Weeds are known to cause monumental losses for an oversized variety of field crop species because of their interference in agroecosystems. A weed means that a plant growing during a place wherever it's not needed [[1]], [[2]]divided the harms of weeds into nine categories: vie with crop plants, in large production prices, reduced quality of crops and animals, increased process costs, problems of water management, human health problems, reduced land value, reduced crop alternative, and lower aesthetic value. Weeds have a major economic impact on agricultural production [[3]]. The reduction in crop yield may additionally be attributed to the allelopathic property exhibited by variety of weeds, especially, the aggressive ones. Such species of weeds, because of their growth habit, build agricultural operations harder. What is more, the crop contaminated with the weed seeds, is taken into account to be of poor quality like seeds of wild oat (*Avena fatua*) in wheat and barley seeds. Toxic weeds further irritate this problem and cause additional costs. Weeds conjointly have an effect on animal productivity by inflicting fodder inadequacy and causation poisoning effects. These plants might cause unwanted flavors in milk and meat. They may also serve as reservoirs or carriers of harmful insects, pests and diseases [[4]].

In agricultural production, the foremost dependable supply of weed management for over fifty years has been the artificial herbicides. a number of the explanations for this are that herbicides are effective, straightforward to use, relatively low-cost and that they scale back the requirement for mechanical suggests that of weed management in and of itself mechanical means enhance soil erosion[[5]].

However, the overuse of artificial herbicides might have an effect on the environment, human health and food [[6]] what is more, the increasing use of the weed killer has resulted in an exceedingly dramatic increase within the herbicide resistance among weeds [[7 and 8]].

Way more work has been done on plant derived compounds as environmentally safe alternatives to herbicides for the weed management [[9]]. These chemicals can be used for weed management directly or their chemistry can be accustomed develop new herbicides [[10 and 11]]In this regard, the utilization of crops having allelopathic properties, will cut back the dependency on artificial herbicides and increase crop yields[[6]]. The biological resolution to attenuate the perceived venturesome impacts from herbicides and pesticides in agriculture production lies within the field of allelopathy. The harmful impact of allelopathy is exploited for persecutor and weed management [[12]].

Recently, the utilization of allelopathic and medicative plants has been urged as a viable choice for different weed management underneath property agriculture [[13 and 14]]. Since the allelopathic potential of the medicative plants like *Achillea Santolina*, *Artemisia monosperma*, *Pituranthus tortuosus* and *Thymus capitatus* has been studied little or no. In Egypt, [[17]] investigated the potential allelopathic effects of *Achillea Santolina*, *Artemisia monosperma*, *Pituranthus tortuosus* (*Deverra tortuosus*) and *Thymus capitatus* (donor species) liquid extract and crude powder on germination, some growth parameters and a few metabolic changes of the 2 crop species; *Hordeum vulgare* and *Triticum aestavium* and also the weedy species; *Medicago polymorpha* underneath laboratory conditions. This study provided info on the chances of victimization one or a lot of the donor species as bio herbicides.

Leaves, barks and roots are the foremost potent supply of allele-chemicals [[15]];[[16]]; however, the hepatotoxic metabolites are distributed all told different plant components in varied concentrations [[17]],info regarding the allelopathic potential of mulberry (*Morus alba* L.) on germination percentage and inhibition percentage of crop weeds within the western Mediterranean regions of Egypt remains inadequate. The allelopathic studies of trees and crops have thus far very little been administrated.

Therefore, the aim of the up to date study was to hold out associate degree analysis of allelopathic activity of leaves and bark of mulberry (*Morus alba* L.) on germination percentage and inhibition percentage of the foremost problematic weeds in maize (*Zea mays* L.) fields; herb (*Chenopodium album* L) .The investigator hopes that the study can offer info regarding the chances of using the target species as bio herbicides.

Materials and Methods:

The student work was achieved throughout the year 2010 and extended to subsequent season throughout 2011. One healthful plant species (Morus Alba L., target or donor) were utilized in this investigation to review its allelopathic potential on seed germination, and a few growth parameters of the weed (Chenopodium album L.) and the crop species (Zea mays L).

Plant Materials:

Leaves and bark of the target species are collected from town El-Arab, forty eight kilometer west of Alexandria town throughout the vegetative stage. The plant materials were dried in shade, then ground during a Wiley Mill to coarse uniform texture and hold on in glass jars till use. Seeds of the weed and crop species were purchased from the International centre, El-Dokki, Giza, Egypt.

Preparation of Target Species Aqueous Extract:
Stock aqueous extract and subsequent dilutions were obtained by the subsequent methods: Dried powder of leaves and bark of mulberry tree (50 g of each) was extracted with three hundred cubic centimeter H2O. The extract was conducted in dark for twenty-four h at 25oC. The suspended was taken and centrifuged at 3000rpm for fifteen minutes; this is able to be full strength concentration (100%). The extracts were ready no quite forty eight h beforehand and were unbroken during a white goods at 5oC till used and also the refined extract was adjusted to hydrogen ion concentration half dozen.8 with 1M HCl. A Series of dilutions were ready from the stock answer (5, 10, twenty and four-hundredth besides the control). And were tested for his or her effects on germination percentage, and inhibition percentage of pigweed L. and also the crop species.

Germination Bioassay:
The petri-dish experiment was applied to research the potential allelopathic effects of the target species liquid extract on germination percentage (GP) and inhibition percentage (IP). To achieve this experiment, twenty seeds of the weed and 10 grains of the crop paper below traditional laboratory conditions with day temperature starting from 19-22^{o}C and night temperature from 12-14^{o}C. 10 ml of the several target species liquid extract (5, 10, twenty and 40) or H2O as an impression were extra daily to 3 replicates during a randomized complete block style. Before sowing, the seeds were immersed in two CHLOREX for two minutes, then rinsed fourfold with H2O. Finally, the seeds were soaked in aerated H2O for twenty-four hours.
Bioassays were applied to test four seed sowing treatments as follows:
1. *Zea mays* in pure culture
2. *Chenopodium album* in pure culture
3. *Zea mays* in mixed culture with *Chenpodium album*
4. *Chenopodium album* in mixed culture with *Zea mays*
Germination percentages were recorded every day for seven successive days.

Calculations
Inhibition percentage (IP) of the target species extract was expressed as a percentage of growth (germination) of the test species in different concentration levels with respect to water control. Higher values indicate lower toxicity [18]. Inhibition percentage (IP) = [1- (allelopathic/control) 100]

Statistical Analysis:
All the data of the present study were subjected where appropriate; to standard one-way analysis of variance (ANOVA) and student's t-test (t-value < 0.05 was considered as significant) using the COSTAT 2.00 statistical analysis software manufactured by CoHort Software Company [19]. Where a significant difference was detected by ANOVA test, pairwise comparisons of means were performed using Least Significant Differences (LSD) at 0.05 probability level.

Results:
Germination Bioassays:
Bioassays were carried out to test the potential allelopathic effect of Morus Alba leaf and bark aqueous extracts (**MALAE** and **MABAE** respectively) on germination percentage (GP) and Inhibition percentage (IP) of dominant weed species Chenopodium album L., in Zea mays L., main crop fields.

Allelopathic potential of MALAE and MABAE on germination percentage (GP) and inhibition percentage (IP) of Zea mays in pure culture.
Data indicated that the two types of extracts exerted a significant weak suppressive effect on (GP) and (IP) of the seeds of the test species.
High significant correlations were calculated from simple linear regression obtained by plotting (GP) and (IP) of the test species versus the different concentrations of **MALAE and MABAE**.

Allelopathic potential of MALAE and MABAE on germination percentage (GP) and inhibition percentage (IP) of Chenopodium album in pure culture.
Data indicated that the two types of extracts exerted a significant strong suppressive effect on (GP) and (IP) of the seeds of the test species**. (Figure1) and (Figure2).**
High significant correlations were calculated from simple linear regression obtained by plotting (GP) and (IP) of the test species versus the different concentrations of **MALAE and MABAE**.

Allelopathic potential of MALAE and MABAE on (GP) and (IP) of Zea mays in mixed culture with Chenopodium album.
Data indicated that the two types of extracts exerted a significant moderate suppressive effect on (GP) and (IP) of the test species.
High significant correlations were calculated from simple linear regression obtained by plotting (GP) and (IP) of the test species versus the different concentrations of **MALAE and MABAE.**

Allelopathic potential of MALAE and MABAE on (GP) and (IP) of Chenopodium album in mixed culture with Zea mays.

Data indicated that the two types of extracts exerted a significant strong suppressive effect on (GP) and (IP) of the test species. **(Figure3) and (Figure4).**

High significant correlations were calculated from simple linear regression obtained by plotting (GP) and (IP) of the test species versus the different concentrations of **MALAE and MABAE**.

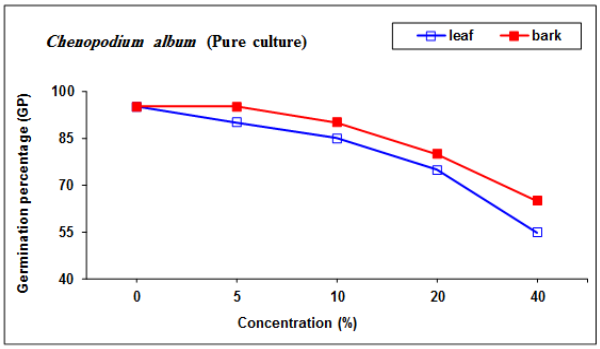

Figure 1. Allelopathic effect of different concentrations of (MALAE) and (MABAE) on (GP) of *Chenopodium album* (weed species) in pure culture germination bioassay.

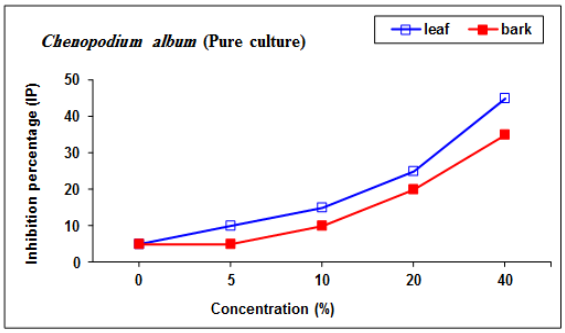

Figure 2 .Allelopathic effect of different concentrations of (MALAE) and (MABAE) on (IP) of *Chenopodium album* (weed species) pure culture germination bioassay.

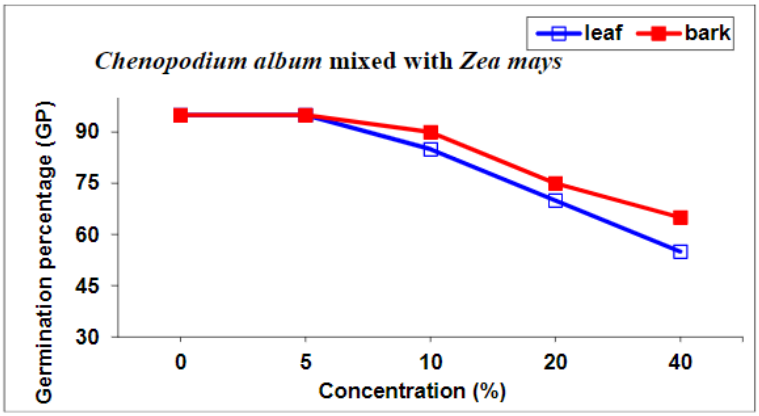

Figure 3. Allelopathic effect of different concentrations of (MALAE) and (MABAE) on (GP) of Chenopodium album in mixed culture (*Chenopodium album* X *Zea mays*) germination bioassay.

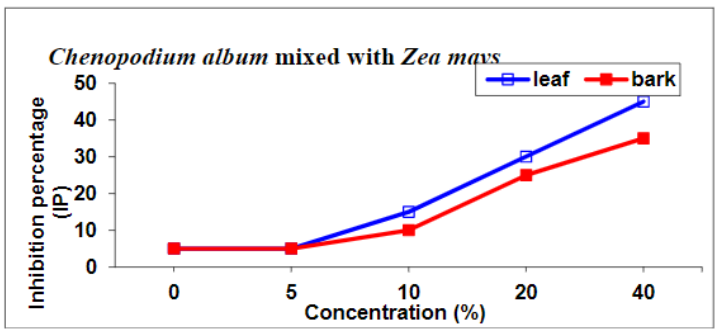

Figure 4. Allelopathic effect of different concentrations of (MALAE) and (MABAE) on (IP) of Chenopodium album in mixed culture (*Chenopodium album X Zea mays)* germination bioassay.

Table 1.Variation in (GP) of *Zea mays* and *Chenopodium album* (pure and mixed cultures) as affected by (MALAE & MABAE) in germination bioassay experiment.

Treatment (%)	*Zea mays*		*Chenopodium album*	
	pure	mixed *C. album*	pure	mixed *Z. mays*
***Morus alba* leaves aqueous extract (MALAE)**				
Control	100^{c}	100^{d}	95^{e}	95^{d}
5	100^{c}	95^{c}	90^{d}	95^{d}
10	95^{b}	80^{b}	85^{c}	85^{c}
20	90^{a}	80^{b}	75^{b}	70^{b}
40	90^{a}	75^{a}	55^{a}	55^{a}
***Morus alba* bark aqueous extract (MABAE)**				
Control	100^{b}	100^{d}	95^{e}	95^{d}
5	100^{b}	95^{c}	95^{d}	95^{d}
10	100^{b}	85^{b}	90^{c}	90^{c}
20	95^{a}	85^{b}	80^{b}	75^{b}
40	95^{a}	80^{a}	65^{a}	65^{a}
P. value*	0.0352	0.0352	0.0171	0.0497

P-value was considered significant at ≤ 0.05 probability level according to paired t-test.
Different letters within each column for the two types of extract indicate a significant difference at probability level ≤ 0.05 according to ONE -WAY ANOVA.

Table 2.Variation in (IP) of *Zea mays* and *Chenopodium album* (pure and mixed cultures) as affected by (MALAE & MABAE) in germination bioassay experiment.

Treatment (%)	*Zea mays*		*Chenopodium album*	
	pure	mixed *C. album*	pure	mixed *Z. mays*
***Morus alba* leaves aqueous extract (MALAE)**				
Control	00^{a}	00^{a}	05^{a}	05^{a}
5	00^{a}	05^{b}	10^{b}	05^{a}
10	05^{b}	20^{c}	15^{c}	15^{b}
20	10^{c}	20^{c}	25^{d}	30^{c}
40	10^{c}	25^{d}	45^{e}	45^{d}
***Morus alba* bark aqueous extract (MABAE)**				
Control	00^{a}	00^{a}	05^{a}	05^{a}
5	00^{a}	05^{b}	05^{a}	05^{a}
10	00^{a}	15^{c}	10^{b}	10^{b}
20	05^{b}	15^{c}	20^{c}	25^{c}
40	05^{b}	20^{d}	35^{d}	35^{d}
P. value*	0.0352	0.0352	0.0171	0.0497

P-value was considered significant at ≤ 0.05 probability level according to paired t-test.
Different letters within each column for the two types of extract indicate a significant difference atprobability level ≤ 0.05 according to ONE -WAY ANOVA

Discussion:

Allelopathic potential of many tree species has been intensively studied [20] , even so little or no data is obtainable concerning the allelopathic potential of mulberry (Morus alba L., Family: Moraceae) trees. This species could act as a possible supply of allelochemicals for natural weed management. Among invasive ligneous plant species occurring in Magyarorszag the allelopathic impact of Manitoba maple (*Acer negundo*), false indigo (*Amorpha fruticosa*), black locust (*Robinia pseudoacacia)*, black walnut (*Juglans nigra*), mulberry (*Morus Alba*), tree-of-heaven (*Ailanthus altissima*), hackberry (*Celtis occidentalis*), black cherry (*Prunus serotina)* and Russian-olive (*Elaeagnus angustifolia*) has been established [21, 22 and 23].

Data of this study indicated that in pure culture, the germination percentage (GP) of maize grains was inefficaciously decreasing with increasing the concentrations of MALAE and MABAE. Consequently, the inhibition percentage (IP) wasn't vital in response to the apparent allelopathic action of the 2 applied extracts.
On the opposite hand, (GP) was considerably decreasing with increasing the concentrations of MALAE and MABAE in mixed culture with *Chenopodium album*. The (IP) percentage was considerably increasing with increasing the concentrations of MALAE and MABAE in mixed culture with *Chenopodium album*
With reference to the weed of the current study (GP) of *Chenopodium album* seeds in pure and mixed culture with *Zea mays* was considerably decreasing with increasing the concentrations of MALAE and MABAE. The (IP) percentage was significantly increasing with increasing the concentrations of MALAE and MABAE.
Data given within the current study were in agreement with many previous studies. as an example, [24] rumored that the liquid extract of *Achillea Santolina, Artemisia monosperma, Pituranthus tortuosus* and *Thymus capitatus* suppressed seed germination of *Medicago polymorpha, melilotus indicus* and *Vicia monantha* below the various concentrations. The degree of inhibition was increased by increasing the concentration. The allelopathic impact of the donor species was hierarchic as follows: *Artemisia monosperma > Thymus capitatus > Achillea Santolina > Pituranthus tortuosus.* On the opposite hand, the germination share (GP) of the 3 investigated recipient species incontestable a gradual decrease with applying higher concentrations of the donor species as follows: *Medicago polymorpha> Vicia monantha> melilotus indicus* no matter the season and therefore the location. The variant response to the allelopathic substance may well be related to the species specific growth restrictive result of allelochemicals and will be concentration dependent [25].

In addition, [26] found that Melissa officinalis shoots liquid extract repressed the seed germination and also the seedling growth of *Amaranthus caudatus, Lepidium sativum, Digitaria sanguinalis, Phleum pratense , Lactuca sativa and Lolium multiflorum* , and also the repressive result was associated with the extract concentration. What is more, such associate inhibition was supported by information provided by different studies [27 and 28]. Moreover, [29] incontestible that liquid extract of *Azadirachta indica* (Neem) shoots reduced the seed germination and also the seedling growth of the six check plant species; *Amaranthus rotundus, Cirsium arvense , Digitaria sanguinalis, Sinapis arvensis, Lactuca sativa* and *Lolium multiflorum* . the best repressive result ascertained because the extract concentration enlarged. [30]found a distinction between the species germination percentages in response to allelopathic materials coming back from *Calotropis gigantea* leaves that agrees with the findings of [31]recommended that the germination percentages (GP) of tomato seeds was reduced (about forty seventh of the control) whene 8% concentration of *Medicago sativa* aqueous extract (MSAE) was applied. Inhibition percentage (IP) or relative reduction in *Lepidium sativum* and *Raphanu. Sativus* enlarged bit by bit with the rise of *Haplophyllum tuberculatum* liquid extract concentration levels [32].These results agree with [31] who found a gradual increase of IP of tomato seeds as a response to the upper concentration levels of *Medicago sativa* liquid extract. [33] Prompt that the inhibition percentage (IP) of crop plants is also thanks to the disturbance within the activities of oxidase, alpha-amylase and acid phosphates. Application of mulberry extract to each oat and birdseed grass seeds resulted in complete germination inhibition of each weeds, which might be attributed to robust allelopathic potential of the mulberry plant [34]Allelopathic potential of the mulberry has additionally been explored antecedently by[14]on pulses and radish, severally.[35]evaluated restrictive effects of mulberry leaf extract on pulses together with peas, broad beans and lentils and according suppression of germination and seedling growth. Leaf of mulberry suppressed natural weed growth [36].
At the tip we tend to conclude that everyone concentrations of MALAE and MABAE reduced germination ability of pigweed that square measure thought-about to be a vital visible and reliable index for the analysis of allelopathic result.

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