



**EFFECTS OF ASTHMA (*Euphorbia hirta*) AND BLACKJACK (*Biden pilosa*) WEEDS EXTRACTS ON *Meloidogyne incognita* EGG HATCHABILITY.**

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**ABSTRACT**

The study investigated the nematicidal potential of aqueous extracts from two common weeds, *Euphorbia hirta* (Asthma plant) and *Bidens pilosa* (Blackjack), on the egg hatchability of *Meloidogyne incognita*. The study is guided by two Objectives; to assess the impact of different concentrations of aqueous extracts of Asthma and blackjack weeds on *M. incognita* egg hatchability and to compare the efficacy of asthma and blackjack weeds extracts on *M. incognita* egg hatchability. The experiment was laid in a Randomized Complete Block Design (RCBD) with nine treatments and three replications. Treatments included crude extracts (T<sub>1</sub> & T<sub>5</sub>) of *E. hirta* and *B. pilosa*, and (T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, ..... T<sub>8</sub>) and their subsequent dilutions at 5 ml, 10 ml, and 15 ml, along with a control/untreated group (T<sub>9</sub>). Results demonstrated significant differences in egg hatchability among treatments. *B. pilosa* crude extract (T<sub>5</sub>) exhibited the most potent effect, recording the lowest egg hatchability at 6.00%. Followed by its diluted forms 16%, 20%, and 23% for the 5 ml, 10 ml, and 15 ml dilutions, respectively. Conversely, the crude *E. hirta* extract resulted in 53% egg hatchability, and its dilutions showed increasing hatchability with increasing dilution, recording 68%, 69%, and 73% for the 5 ml, 10 ml, and 15 ml treatments, respectively. While the control group exhibited an 89% egg hatch. These findings revealed that *Bidens pilosa*, particularly its crude extract, possesses strong nematicidal properties against *M. incognita* egg hatch. Further research is warranted to isolate and characterize more of the active compounds responsible for this activity and to evaluate their efficacy under field conditions as potential sustainable alternatives for nematode management.

**Keywords:** Egg, Hatchability, *Meloidogyne incognita*, Nematicidal, Plant, Extracts

**INTRODUCTION**

Plant parasitic nematodes are microscopic wormlike multicellular organism bilaterally unsegmented with well-developed nervous, reproductive and digestive systems. The nematodes *Meloidogyne sp.* are soil born pests of agricultural importance that significantly affect crop yield. Many species were identified all around the world and they form serious threat especially to vegetable production. There are 4,100 species of herbivorous nematodes identified and these species are the leading species that cause yield and quality losses in cultivated plants (Lerzan & Bahadır, 2021). *M. incognita* infestation on host plants not only results in the development of abnormal expansion of root systems (roots galls or knot) but also inflicts on the root during feeding activity which often provide other pathogens an entry point such as bacteria and fungi and these interfere with the normal water and nutrients uptake of the plant (Subedi *et al.*, 2020).

Minimizing and or control of root knot nematodes for decades is being accompanied by the use of synthetic chemicals although remarkable result is achieved, however excessive use and poor handling of these chemicals lead to health hazard, resistance by the target pests and destabilization of the ecosystem of the crop and reduced crops' resistance to drought (Shilpa *et al.*, 2022). Also, other problems include high cost (affordability) and availability of the synthetic nematicides at a time of need particularly to small scale farmers that constitutes the bulk of farming population particularly in Nigeria Wachira *et al.* (as cited in Aji, 2024). Similarly, Abd-Elgawad (2020) pointed out that, searching for alternative means of controlling *M. incognita* that are less toxic to human and ecofriendly has become imperative. Other conventional methods for nematode control include cultural,



physical, biological and plant resistance have been reported to have limitations of one kind or the other (Lemic *et al.*, 2020). Kundu *et al.* (2021) suggested that plant extracts and powders offer a promising means for combating root knot nematodes.

Plant parts and their products have been found to possess nematicidal properties against plant parasitic nematodes. In related development, Ibrahim *et al.* (2024); Mwamula *et al.* (2022) noted that nematicides of plant origin contain bioactive compounds such as isothiocyanates, glucosides, alkaloids, phenolic and fatty acids and these attributes form the best possible alternative strategies for the control of plant parasitic nematodes. Besides, Aji (2024) also emphasized the importance of using plant extracts and powders which when used appropriately, appear to provide a good substitute for synthetic nematicides. Equally, the Food Agricultural Organization Statistics, FAOSTAT, (2019) is of the view that, research on safer alternatives to synthetic nematicides is crucial for the continued production of tomato as one of the most important global vegetables Karungi *et al.* (as cited in Denis, 2020). Researchers have focused a great deal of emphasis on alternative plant parasitic nematode management options that do not negatively impact the ecosystem Mashela *et al.* (as cited in Aji, 2024). This necessitates the use of extracts of asthma (*Euphorbia hirta*) and blackjack weeds (*Bidens pilosa*) to evaluate their potentials on egg hatchability of *M. incognita* and:

- i. to assess the impact of different concentrations of aqueous extracts of Asthma and blackjack weeds on *M. incognita* egg hatchability.
- ii. to compare the efficacy of asthma and blackjack weeds extracts on *M. incognita* egg hatchability.

## **MATERIALS AND METHODS**

### **Experimental Site**

The study was carried out in the laboratory of crop protection department, Modibbo Adama University, Yola. Located within the latitude 9.3489° N and 12.5032°E.

### **Plant Materials and Preparation of crude extracts**

Fresh asthma (*Euphorbia hirta*) and blackjack (*Bidens pilosa*) weeds were collected from their growing stands within and around Jimeta, Yola North Local Government Area of Adamawa State. The collected fresh experimental weeds were washed with water and shade dried for seven days on a clean polythene bag after which the dried leaves were grounded into powder separately using clean pestle and mortar and were stored separately and labelled in air tight containers to avoid mix up and /or commination (Fabiya *et al.*, 2020a). Aqueous extracts of each powder were prepared through the use of method described by Umar and Mohammed (2013). This involved soaking 50g of each weed powder separately in 500ml of distilled water contain in volumetric flask for 24hours which were later be filtered through Whatman filter paper and the filtrate obtained constituted the crude extracts termed (T1) for *Euphorbia hirta* and (T5) for *Bidens pilosa* respectively. Further dilutions of 10ml of each crude extract with 5, 10, and 15 ml of distilled water to obtain the respective treatments were also done.

### **Plant Bioactive Chemical Screening**

The plant extracts were screened for plant bioactive chemical constituents to determine both the presence and quantity of saponins, alkaloids, terpenoids, phenols, flavonoids and tannins. However, in order to further ascertain the biological active chemical compounds, gas chromatography – mass spectrometry (GC-MS) analysis was also carried out using the procedure described by Balamurugan *et al.* (2019).

### **Inoculum Source**

The inoculum for the experiment were eggs which were extracted the infested plants roots using sodium hypochlorite extraction method as described by (Seenivasan and Senthilnathan, 2018). This was achieved by vigorously shaking of infested tomato plant roots in a 1% sodium hypochlorite solution for 2-3 minutes. The resulting suspension was passed through 75µ and was collected on 35µ mesh-size sieve. This served as the nematode suspension for the experiment.



### Experimental Lay out

The experiment consisted of nine treatments (9) laid in randomized complete block design (RCBD) and were replicated three (3) times. Approximately 100 eggs of *M. incognita* were introduced to each of the 27 petri dishes using syringe and followed by introduction of 10ml crude extracts of the botanicals (T<sub>1</sub> and T<sub>5</sub>) and their diluted forms (T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>,.....T<sub>8</sub>) respectively. While the control (T<sub>9</sub>) remained in distilled water only. The egg hatching was observed for a period of ninety-six hours (96) at the interval of twenty-four hours (24). Hatched eggs were viewed and counted under microscope.

### Data analysis

Data collected were analyzed and or calculated using formular described by Ogwudire *et al.* (2022) i.e., % Hatchability =  $X/N \times 100/1$  where X= No of hatched eggs, N= Total number of eggs placed per petri dish.

## RESULTS

### Phytochemical Composition of the Weeds Extracts

The result of phytochemical/plant bioactive chemical constituents of Blackjack (*Bidens pilosa*) and Asthma (*Euphorbia hirta*) extracts is presented in Table 1. The result indicated that Saponins, Terpenoids, Flavonoid, Alkaloids, Tannins and phenols were detected in both asthma and black jack weed extracts while steroids were detected in *Euphorbia hirta* and absent in *Biden pilosa*. However, glycosides were absent in both *Euphorbia hirta* and *Bidens pilosa*.

### Compounds Identified from Gas chromatography-Mass Spectrometry (GC-MS) Analyses of the Weeds' Extracts.

The results of phytochemical profiles of the aqueous extracts of *Bidens pilosa* and *Euphorbia hirta* were presented in Tables 2 & 3 respectively. The results revealed a complex mixture of compounds in both the botanicals, with 28 distinct peaks from *B. pilosa* and 31 from *E. hirta*. The analysis was based on retention times, area percentages, and molecular weights of the compounds which were all necessary for the identification. Ethyl 9,12,15-octadecatrienoate was found to be the most abundant compound in blackjack weed (*B. pilosa*) with a retention time of 25.263 minutes, an area of 100%, and a molecular weight of 306, indicating a high prevalence of this fatty acid ester. Followed by Pentanedioic acid, 2-methyl- with 10.458 retention time, (28.53%) and 146 molecular weights, followed n-Octyl phenyl ketone 14.756 retention time, (27.73%), 218 and Methyl stearate with 15.51 retention time, (25.28%), 298 molecular weights. While in asthma weed (*E. hirta*), 9,12-Octadecanoic acid (Z, Z)-, methyl ester was the most abundant chemical compound (retention time: 14.705 min; area: 100%; MW: 294), which means that it has a unique fatty acid profile. Also, other compounds include Octanoic acid, ethyl ester with 4.667 retention time, (73.51%) and 172 molecular weights, followed by Decanoic acid with 7.086 retention time, (65.63%), and 200 molecular weights among others. However, the Tables contained the bioactive compounds based on their peak number, Retention time, area peak, compound name, molecular structure, molecular weight and biological activity of some of the compounds.

**Table 1:** Plant bioactive chemical screening results of *Euphorbia hirta* and *Bidens pilosa*

Constituents	<i>E. hirta</i>	<i>B. pilosa</i>
Saponins	2.47	5.38
Terpenoids	0.33	0.52
Tannins	7.02	11.81
Steroids	0.81	-
Flavonoid	9.66	11.71
Phenols	13.75	17.09
Alkaloids	5.27	7.05
Glycosides	-	-

**Table 2:** Compounds Identified in Aqueous Extract of *Bidens pilosa* using GC-MS Analysis.

S/No	RETENTION TIME	AREA (%)	COMPOUND NAME	MOL FORMULAR	MOL WEIGHT (g/mol)	BIOLOGICAL ACTIVITY	REFERENCE
1	2.946	2.04	Pentanedioic acid, 2-oxo-, dimethyl ester	C <sub>7</sub> H <sub>10</sub> O <sub>5</sub>	174	Not reported	Not reported
2	4.059	2.59	Diacetamide	C <sub>4</sub> H <sub>7</sub> NO <sub>2</sub>	101	Not reported	Not reported
3	5.26	2.24	9-Oxononanoic acid	C <sub>9</sub> H <sub>16</sub> O <sub>3</sub>	172	Not reported	Not reported
4	5.999	6.1	3,4-Diethylphenol	C <sub>10</sub> H <sub>14</sub> O	150	Not reported	Not reported
5	7.105	3.57	Tetradecane	C <sub>14</sub> H <sub>30</sub>	198	Anti-microbial cytotoxicity, anti-helminthic.	Shetty <i>et al.</i> (2024); Nasr <i>et al.</i> (2022)
6	8.247	4.07	Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl-	C <sub>15</sub> H <sub>22</sub>	202	Not reported	Not reported
7	8.386	4.91	1,3-Cyclohexadiene, 5-(1,5-dimethyl-4-hexenyl)-2-methyl-, [S-(R*,S*)]-	C <sub>15</sub> H <sub>24</sub>	204.35	Not reported	Not reported
8	8.532	4.18	(Z,Z)- $\alpha$ -Farnesene	C <sub>15</sub> H <sub>24</sub>	204	Not reported	Not reported
9	8.745	3.69	6-(3-Methyl-3-cyclohexenyl)-2-methyl-2,6-heptadienol	C <sub>15</sub> H <sub>24</sub> O	220	Not reported	Not reported
10	9.426	6.02	1-Nonadecene	C <sub>19</sub> H <sub>38</sub>	266	anti-bacterial, anti-microbial, cytotoxic effect	Shetty <i>et al.</i> (2024)
11	9.499	8.12	Hexanoic acid, 4-oxo-, methyl ester	C <sub>7</sub> H <sub>12</sub> O <sub>3</sub>	144	Not reported	Not reported
12	9.741	2.62	Benzenediamine, $\alpha$ ,2,6-trimethyl-, ( $\pm$ )-	C <sub>11</sub> H <sub>17</sub> N	163	Not reported	Not reported
13	10.114	2.11	Diazoprogesterone	C <sub>21</sub> H <sub>30</sub> N <sub>4</sub>	338	Not reported	Not reported
14	10.458	28.53	Pentanedioic acid, 2-methyl-	C <sub>6</sub> H <sub>10</sub> O <sub>4</sub>	146	Not reported	Not reported
15	10.839	11.37	Curlone	C <sub>15</sub> H <sub>22</sub> O	218	Not reported	Not reported
16	11.337	1.15	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-9-(phenylsulfonyl)-, (E,E)-	C <sub>21</sub> H <sub>30</sub> O <sub>3</sub> S	362	Not reported	Not reported
17	11.644	10.24	Pentanedioic acid, dimethyl ester	C <sub>7</sub> H <sub>12</sub> O <sub>4</sub>	160	Not reported	Not reported
18	11.71	6.17	Phenol, 2-ethyl-4,5-dimethyl-	C <sub>10</sub> H <sub>14</sub> O	150	Not reported	Not reported
19	12.545	2.75	Didodecyl phthalate	C <sub>32</sub> H <sub>54</sub> O <sub>4</sub>	502	Not reported	Not reported
20	13.028	11.62	Hexadecenoic acid, methyl ester	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	270	inducing toxicity into the larvae and eggs, and interfering	Reported by Azeem <i>et al.</i> (2025) & Abubakar <i>et al.</i> (2013)



21	13.292	1.94	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester	$C_{18}H_{28}O_3$	292	with nematodes' feeding and reproduction Not reported	Not reported
22	13.497	2.07	Phenol, 5-methyl-2-(1-methylethyl)-, acetate	$C_{12}H_{16}O_2$	192	Not reported	Not reported
23	14.698	10.2	9,15-Octadecadienoic acid, methyl ester, (Z,Z)-	$C_{19}H_{34}O_2$	294	Not reported	Not reported
24	14.756	27.73	n-Octyl phenyl ketone	$C_{15}H_{22}O$	218	Not reported	Not reported
25	15.51	25.28	Methyl stearate	$C_{19}H_{38}O_2$	298	Not reported	Not reported
26	15.745	6.69	Cyclohexene, 1-(1-propynyl)-	$C_9H_{12}$	120	Not reported	Not reported
27	16.433	4.97	1H-Indene-3-carboxaldehyde, 2,6,7,7a-tetrahydro-1,5-dimethyl-	$C_{12}H_{16}O$	176	Not reported	Not reported
28	25.263	100	Ethyl 9,12,15-octadecatrienoate	$C_{20}H_{34}O_2$	306	Not reported	Not reported



**Table 3: Compounds Found in *Euphorbia hirta* Using GC-MS Analysis**

S/N	RETENTION TIME	AREA (%)	COMPOUND NAME	MOL FORMULAR	MOL WEIGHT (g/mol)	BIOLOGICAL ACTIVITY	REFERENCE
1	2.448	6.78	(RR)-4-methyl-2,3-pentenediol	C <sub>6</sub> H <sub>14</sub> O <sub>2</sub>	118	Not Reported	Not Reported
2	2.653	6.63	α,β-Methyl-2-deoxy-D-ribosepyranoside	C <sub>6</sub> H <sub>12</sub> O <sub>4</sub>	148	Not Reported	Not Reported
3	4.667	73.51	Octanoic acid, ethyl ester	C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	172	Antibacterial	Reported by Mayser <i>et al.</i> (2015)
4	5.282	19.34	2,4-Pentadien-1-ol, 3-propyl-, (2Z)-	C <sub>8</sub> H <sub>14</sub> O	126	Not reported	Not reported
5	5.86	24.02	Pentanoic acid, 2-(aminooxy)-	C <sub>5</sub> H <sub>11</sub> NO <sub>3</sub>	133	Not reported	Not reported
6	6.292	2.24	4-Acetoxy-3-methoxystyrene	C <sub>11</sub> H <sub>12</sub> O <sub>3</sub>	192	Not reported	Not reported
7	7.068	65.63	Decanoic acid, ethyl ester	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	200	Not reported	Not reported
8	7.749	2.56	1-Butanol, 4-(hexyloxy)-	C <sub>10</sub> H <sub>22</sub> O <sub>2</sub>	174	Not reported	Not reported
9	8.21	13.53	3-Heptanol, 3,6-dimethyl-	C <sub>9</sub> H <sub>20</sub> O	144	Not reported	Not reported
10	8.767	3.4	2-Dodecen-1-ol, 12-chloro-	C <sub>12</sub> H <sub>23</sub> ClO	218	Not reported	Not reported
11	9.419	15.04	2-Cyclopenten-1-one, 2-(2-butenyl)-3-methyl-, (Z)-	C <sub>10</sub> H <sub>14</sub> O	150	Not reported	Not reported
12	9.499	23.67	Nonadecane	C <sub>19</sub> H <sub>40</sub>	268	anti-bacterial, anti-microbial, cytotoxic effect,	Reddy <i>et al.</i> (2015)
13	10.18	6.59	Phenol, 2,3,4,6-tetramethyl-	C <sub>10</sub> H <sub>14</sub> O	150.22	Not reported	Not reported
14	11.644	20.61	1-Eicosanol	C <sub>20</sub> H <sub>42</sub> O	298	Anti-bacterial, anti-tumor, anti-fungal, cytotoxic	Shetty <i>et al.</i> (2024)
15	11.71	12.54	Heptadecane	C <sub>17</sub> H <sub>36</sub>	240	Not reported	Not reported
16	11.908	2.5	1,2-Pentadiene, 4-methoxy-4-methyl-	C <sub>7</sub> H <sub>12</sub> O	145	Not reported	Not reported
17	12.15	1.7	2-Dodecen-1-ol, 12-chloro-	C <sub>12</sub> H <sub>23</sub> CO	218	Not reported	Not reported
18	12.472	2.3	2-Isopropyl-5-methylcyclohexyl 3-(1-(4-chlorophenyl)-3-oxobutyl)-coumarin-4-yl carbonate	C <sub>30</sub> H <sub>33</sub> CO <sub>6</sub>	524	Not reported	Not reported
19	12.545	7.26	Didodecyl phthalate	C <sub>32</sub> H <sub>54</sub> O <sub>4</sub>	502	Not reported	Not reported
20	13.028	36.6	Hexadecanoic acid, methyl ester	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	270	Not reported	Not reported
21	13.292	3.97	Benzenepropanoic acid, 3,5-bis(1,1-	C <sub>18</sub> H <sub>28</sub> O <sub>3</sub>	292	Not reported	Not reported



			dimethylethyl)-4-hydroxy-, methyl ester				
22	13.504	14.66	[1-[Nonafluorobutyl]pentylidene]hydroxylamine	C <sub>9</sub> H <sub>10</sub> F <sub>9</sub> NO	319	Not reported	Not reported
23	13.673	23.75	Butanoic acid, 3-methyl-3-nitroso-, methyl ester	C <sub>6</sub> H <sub>11</sub> NO <sub>3</sub>	145	Not reported	Not reported
24	14.09	3.49	[1-[Nonafluorobutyl]pentylidene]hydroxylamine	C <sub>9</sub> H <sub>10</sub> F <sub>9</sub> NO	319	Not reported	Not reported
25	14.705	100	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	294	Not reported	Not reported
26	14.756	71.8	6-Octadecenoic acid, methyl ester, (Z)-	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	296	Not reported	Not reported
27	15.005	9.71	Methyl stearate	C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>	298	Not reported	Not reported
28	15.745	11.55	1-Nonadecene	C <sub>19</sub> H <sub>38</sub>	266	anti-bacterial, anti-microbial, cytotoxic effect	Shetty <i>et al.</i> (2024)
29	17.238	8.96	Bicyclo[3.2.1]oct-3-en-2-one, 3,8-dihydroxy-1-methoxy-7-(7-methoxy-1,3-benzodioxol-5-yl)-6-methyl-5-(2-propenyl)-, [1R-(6-endo,7-exo,8-syn)]-	C <sub>21</sub> H <sub>24</sub> O <sub>7</sub>	388	Not reported	Not reported
30	20.336	30.76	5,10-Pentadecadienoic acid, (Z,Z)-	C <sub>15</sub> H <sub>26</sub> O <sub>2</sub>	238	Not reported	Not reported
31	21.485	8.69	Trimethyl[4-(1,1,3,3-tetramethylbutyl)phenoxysilane	C <sub>17</sub> H <sub>30</sub> O	278	Not reported	Not reported

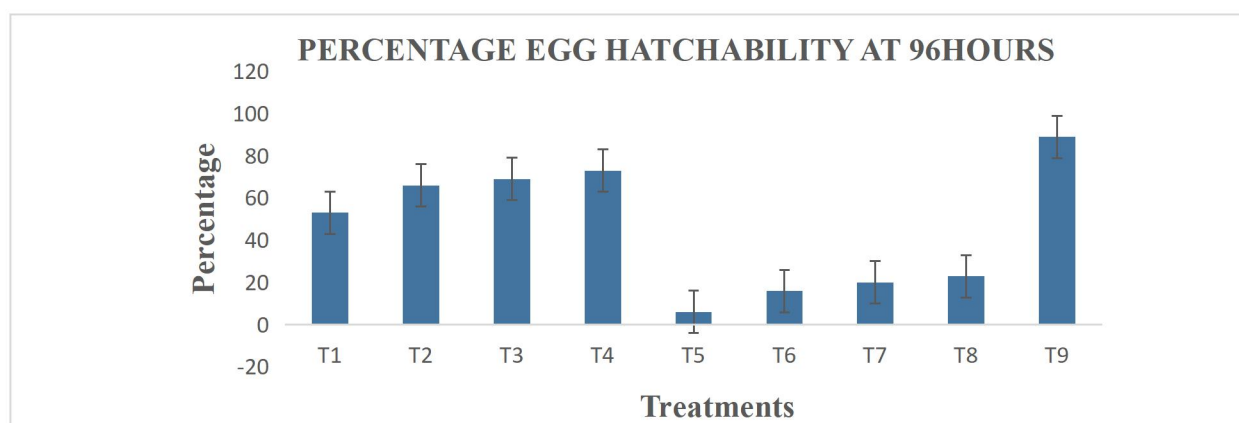
### **Effect of Blackjack (*Bidens pilosa*) and Asthma (*Euphorbia hirta*) Crude Extracts on Egg Hatchability of *Meloidogyne incognita***

Table 4 presents the effect of weeds extracts on egg hatchability of *M. incognita* after 96 hours of exposure. There was highly significant difference among the respective treatments. The rate of hatching was directly proportionate to the period of exposure and to the concentration of extracts as the hatching rate decreases with further dilution of extracts. *Bidens pilosa* crude extract recorded the least number of egg hatch of 6.00 followed by its other concentrations of 5, 10 and 15ml; 16, 20 and 23 respectively. While *Euphorbia hirta* crude extract and its other concentration of diluted forms recorded 53, 66, 69, and 73 respectively which is higher than its counterpart *B. pilosa*. However, the untreated/control treatment containing only distilled water recorded the highest number of egg hatch to juveniles of 89 percent (figure 3).

**Table 4:** Effect of Different Concentration of Asthma (*Euphorbia hirta*) and Blackjack (*Bidens pilosa*) Weed Extracts on Egg Hatching of Root Knot Nematode (*Meloidogyne incognita*)

Treatments		Hatching percentage up to 96 hours			
		24 hours	46hours	72 hours	96hours
Asthma weed crude extract only	T <sub>1</sub>	65 (35%)	51 (49%)	49 (51%)	47 (53%)
Asthma crude + 5ml distilled water	T <sub>2</sub>	75 (25%)	53 (47%)	38 (62%)	34 (66%)
Asthma crude + 10ml distilled water	T <sub>3</sub>	76 (24%)	62 (38%)	51 (49%)	31 (69%)
Asthma crude + 15ml distilled water	T <sub>4</sub>	62 (38%)	35 (55%)	40 (60%)	27 (73%)
Blackjack weed crude extract only	T <sub>5</sub>	98 (2%)	98 (2%)	97 (3%)	94 (6%)
Blackjack crude + 5ml distilled water	T <sub>6</sub>	93 (7%)	89 (11%)	87 (13%)	84 (16%)
Blackjack crude +10ml distilled water	T <sub>7</sub>	96 (4%)	92 (8%)	86 (14%)	80 (20%)
Blackjack crude +15ml distilled water	T <sub>8</sub>	94 (6%)	89 (11%)	83 (17%)	77 (23%)
Control (Distilled water only)	T <sub>9</sub>	4 (96%)	6 (94%)	6 (94%)	11 (89%)

Note: (i) Data are average value of the three replications (ii) Initial Eggs number Placed Per Petri Dish: 100 (iii) Data in parentheses are the percentage of Egg hatched.



**Figure 1:** Effect of Different concentration of Asthma (*Euphorbia hirta*) and Blackjack (*Bidens pilosa*) Weed Extracts on Egg Hatchability of Root Knot Nematode (*Meloidogyne incognita*)

## DISCUSSION

Result from this study showed that aqueous extracts of *Bidens pilosa* and *Euphorbia hirta* were potent in controlling *Meloidogyne incognita* at varying degrees and this could be linked to the rich profile of compounds (Anekwe *et al.*, 2023; Alam and Nuby, 2022) obtained from the phytochemical and GC-MS analyses. These results are in agreement with previous results among which indicated that aqueous extracts of *J. curcas*, *P. granatum*, inhibited egg hatching and mortality of second-stage juveniles J2 of *M. incognita* in an in vivo and in vitro assay (Ogwudire, *et al.*, 2022); Okechalu *et al* (2020) who reported that the presence of Saponins, Terpenoids, Flavonoid, Alkaloids, Tannins and Phenols as biological active ingredients in the aqueous extracts of *Commelina bengalensis* and *Bidens pilosa* which are essential in the nematodes, RKN management. From the results obtained it would be clearly understood that these botanical extracts are very effective and environmentally friendly means of pests control as natural compounds particularly nematodes (Aji, 2024; Shubham *et al.*, 2023; Ngegba *et al.*, 2022; Khanna *et al.*, 2022;) who reported that, the materials are cheaper & cost effective, readily available and easily adopted by the farmers.

It is apparent from the results obtained from the invitro study; all the experimental weeds inhibited egg hatching with varying degrees of nematotoxicity. This coincides with the findings of Danahap *et al.* (2024) nematicidal effect of *T. indica* on root knot nematode increased with increase in concentration of extract and time of exposure; Bajestani *et al.* (2017) who tested the nematotoxic effect of *Cassia siamea* and *Camal dulensis* on egg hatching and juvenile mortality of root-not nematode (*M. javanica*). Their findings revealed egg hatching was inhibited to varying degrees when exposed to





different concentration over time. In another related development, the results of this finding further exposed that the rate of hatching was directly proportionate to exposure period and inversely proportionate to concentration of extracts as it was decreased with decrease in concentration (Patil *et al.*, 2017). This corroborates with the findings of Ahmed *et al.* 2019 which revealed that the toxicity of crude extract decreases with further dilutions.

However, blackjack (*B. pilosa*) weed extract was more effective as it showed high inhibitory effect on the nematodes' egg hatchability (*M. incognita*) with 6.00 for the crude and 16, 20 and 23 for its other diluted forms 5, 10 and 15ml respectively. This might be connected to organic compounds contained in the botanicals such as the saponins, terpenoids, phenol, alkaloids etc and this corroborates with the findings of Okechalu *et al* (2020).

## CONCLUSION AND RECOMMENDATION

The study evaluated the nematicidal potential of aqueous extracts from two common weeds, *Euphorbia hirta* (asthma plant) and *Bidens pilosa* (blackjack), on the egg hatchability of *Meloidogyne incognita*. Based on the findings of the study, the crude extract of *Bidens pilosa* proved effective, recording the lowest egg hatchability of the *Meloidogyne incognita* at a mere 6.00% compared to the 53% of *Euphorbia hirta* and 89% in the untreated control. These results, supported by the identification of rich bioactive constituents (including fatty acid esters and phenolics) via phytochemical and GC-MS analyses, which validate *Bidens pilosa* as a potent, readily available, and environmentally friendly resource. It is therefore concluded that *B. pilosa* offers a crucial, cost-effective, and sustainable alternative to hazardous synthetic nematicides for the management of *M. incognita* in agricultural production.

Based on the results obtained, the following recommendations were made:

1. The result revealed that botanical *Bidens pilosa* is effective in the control of *Meloidogyne incognita* and therefore recommended for the incorporation of the extracts into agricultural soils for crops production.
2. There is a need to further explore the effectiveness of the botanical as nematicide, its formulation, and method of application.
3. There is a need for further phytochemical analysis to further identify the presence of bioactive nematicidal compounds released by this botanical using other solvents.

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