



One Health
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Effect of *Argemone ochroleuca* extracts on *Meloidogyne javanica* and tomato growth under greenhouse conditions

Yvonne Gurumani¹; Nicholus Mnyambo²;
Moses Timana³; Zakheleni Dube⁴

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Introduction

- Human growth.
- Food demand.
- Plant-parasitic nematodes (Seid *et al.*, 2015).



Figure 1: *A. ochroleuca* (Anna, 2013).



Materials and methods

- The study was conducted at the Biology Laboratory and under greenhouse conditions (25.4365 ° S, 30.9818 ° E), University of Mpumalanga, Nelspruit, South Africa.



Figure 2: Inside the greenhouse (UMP)



Materials and methods cont...

Achieving objective 1: To identify and quantify phytochemicals present in *Argemone ochroleuca* extracts with potential for nematode management

Preparation of powdered leaf meals

- *Argemone ochroleuca* stems and leaves: University of Mpumalanga farm
 - the leaves were cut into 5-cm-long pieces.
 - milled into fine powder using a blender.
 - oven-dried for four days at 52°C.

Then crudely ground, powdered meals were kept in labelled containers and stored for later use.



Materials and methods cont...

Preparation of aqueous extract of *Argemone ochroleuca*

- The aqueous water extracts: 10 mL of distilled water to one gram of the powdered *Argemone ochroleuca* in a 100 ml conical flask.
 - The mixture was left in a rotary shaker for 48 hours.
 - Filtered through a funnel lined with a Whatman filter paper no. 42.
 - The filtrates were kept in the refrigerator at 4 °C until required for further test.



Materials and methods cont...

Phytochemical analysis

Qualitative analysis

- Colorimetric test was done following the method by Bista *et al.* (2020) and Prakash *et al.* (2017).
- Phytochemicals such as: glycoside, flavonoid, saponin, phenols, tannins, terpenoid and steroids.

Quantitative analysis

- Phytochemicals identified above were quantified following the method by Shafika *et al.* (2020).



Materials and methods cont...

Achieving objective 2: To assess the efficacy of *Argemone ochroleuca* plant extracts in the management of *Meloidogyne javanica* and tomato plant growth

- Tomato seedlings: 25-centimeter diameter pots.
- The experiment was arranged as a 2 x 7 factorial experiment in a randomized complete block design:
 - First factor consisted of two plant parts (stem and leaves).
 - Second factor consisted of five application rates (2g, 4g, 6g, 8g, 10g) and a negative control.



Materials and methods cont...

- One week after planting: Tomato seedlings were inoculated with 3 000 *M. javanica* eggs and second-stage juvenile (J2):
 - 20 ml plastic syringe by putting them on cardinal stem points in 2½ cm deep hole.
- Scouting and monitoring for insect pests was performed daily.
- Irrigation was done after every one day.

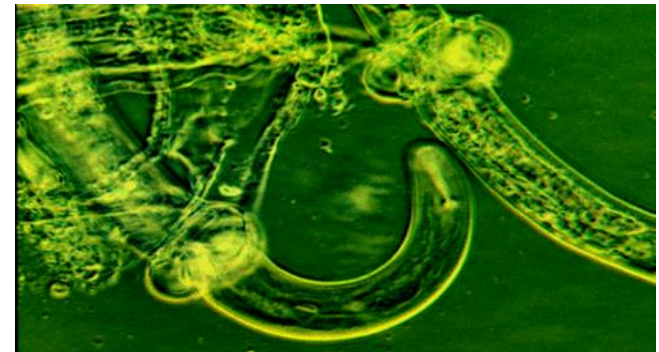


Figure 3: *Meloidogyne javanica*
(Angela and Robert, 2016)

Data collection

At 56 days:

- **Plant variables**
 - Plant height
 - Stem diameter
 - Chlorophyll content
 - Shoots were oven dried
- **Nematode variables**
 - Nematode juveniles in roots and soil, and nematode eggs in roots were extracted (Fourie *et al.*, 2017).

Data analysis

- Statistix-10 software
 - Normality test: Shapiro-Wilk's \longrightarrow Transformation: $\log_{10}(x + 1)$
 - ANOVA \longrightarrow Fisher's LSD to separate treatment means ($P < 0,05$)



Results and discussions

Table 1: Phytochemical screening

Phytochemicals	Roots		Shoots	
	Water extract	Ethanol extract	Water extract	Ethanol extract
Glycosides	+	+	+	+
Alkaloids	+	+	+	+
Saponins	+	-	+	-
Tannins	-	-	-	-
Phenols	-	-	-	-
Flavonoids	+	-	+	-
Terpenoids	+	-	+	-
Steroids	-	-	-	-



Results and discussions

Table 2: Effects of *Argemone ochroleuca* on nematodes variables.

Application rate	Gall rating	Eggs in roots	Juvenile in roots	Total Nematodes in roots	Total Nematodes
0	0.83 ^a (6.05)	139.25 ^{ab} (11880)	0.67 ^a (6198.00)	19900 ^a (21241)	20380 ^a (22292)
2	0.83 ^a (5.80)	111.50 ^{bc} (11880)	0.65 ^{ab} (3940.00)	14610 ^b (15820)	15030 ^b (16220)
4	0.73 ^b (5.20)	83.90 ^{c d} (8380)	0.63 ^b (5560.00)	12120 ^{bc} (13940)	12610 ^{bc} (14540)
6	0.69 ^b (3.60)	57.70 ^{d e} (5400)	0.63 ^b (2400.00)	8790 ^{c d} (7800)	9570 ^{c d} (8340)
8	0.75 ^b (5.00)	56.80 ^{de} (5040)	0.63 ^b (2980.00)	9250 ^{c d} (8020)	9650 ^{c d} (8260)
10	0.73 ^b (4.80)	47.8 ^e (5860)	0.63 ^b (2380.00)	6910 ^d (8240)	7590 ^d (8800)
P value	0.00**	0.00**	0.00**	0.00**	0.00**
LSD value	0.06	3181.40	0.02	3763.10	3775.80
F value	6.28	12.40	3.42	16.62	15.77

Columns means followed by the same letter are not significantly different at ($p \leq 0.05$, according to Fisher's least significant difference. Values in brackets are untransformed means. **Highly Significant ($P \leq 0.01$)



Results and discussions

Table 3: Effect of plant parts on plant variables

Plant Parts	Plant Height	Fresh Root Mass	Fruits	Leaves
Leaves	35.43 ^a (35.37)	1.36 ^a (22.47)	0.04 ^a (-0.00)	1.08 ^a (11.27)
Stems	31.29 ^b (31.10)	1.27 ^b (19.82)	0.00 ^b (0.17)	1.04 ^b (10.00)
P value	0.00**	0.00**	0.28	0.03*
LSD value	2.17	0.05	0.04	0.03
F value	14.55	11.71	1.27	4.86

Columns means followed by the same letter are not significantly different at ($p \leq 0.05$, according to Fisher's least significant difference. Values in brackets are untransformed means. Not significant ($P > 0.05$); *Significant ($P < 0.05$); **Highly Significant ($P < 0.01$)



Results and discussions

Table 4: The interaction of plant parts and application rate with fresh root mass and flowers

Plant Parts	Application Rate	Fresh root mass	Flowers
Leaves	0	1.33 ^{bcd} (21.40)	0.00 ^c (0.00)
Leaves	2	1.33 ^{bcd} (24.36)	0.00 ^c (0.00)
Leaves	4	1.24 ^{cd} (19.11)	0.00 ^c (0.00)
Leaves	6	1.36 ^{abc} (20.30)	0.13 ^{abc} (0.80)
Leaves	8	1.43 ^{ab} (22.36)	0.18 ^{ab} (0.60)
Leaves	10	1.20 ^d (27.25)	0.25 ^a (0.20)
stems	0	1.33 ^{bcd} (21.39)	0.00 ^c (-0.00)
Stems	2	1.30 ^{bcd} (19.89)	0.00 ^c (0.20)
Stems	4	1.27 ^{cd} (22.35)	0.00 ^c (0.00)
Stems	6	1.24 ^{cd} (20.48)	0.00 ^{bc} (0.00)
Stems	8	1.24 ^{cd} (18.37)	0.00 ^c (0.00)
Stems	10	1.20 ^d (18.26)	0.25 ^a (1.00)
P value		0.02*	0.05*
LSD value		0.13	0.16
F value		2.77	4.47

Columns means followed by the same letter are not significantly different at ($p \leq 0.05$, according to Fisher's least significant difference. Values in brackets are untransformed means. *Significant ($P \leq 0.05$); **Highly Significant ($P \leq 0.01$)



Conclusions and recommendations

- This study indicates that the plant extracts contains some nematicidal properties in the plant studied.
- There is a need to test for toxicity of plant extracts as concentrations increases.
- This study must be done focusing on the bigger range of application rate.



References

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Thank you for your attention!

Yvonne GURUMANI

Mobil: +27(0) 76 548 9897

E-mail: 201929627@ump.ac.za

Address: University of Mpumalanga, Private
Bag X11283, Mbombela,
1200

