



# **APPLICATION EFFECT OF ENCEPHALARTOS VELLOUSUS SOIL ON GROWTH AND YIELD OF SWISS CHARD AND MUSTARD: SUSTAINABLE APPROACH**

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# Introduction

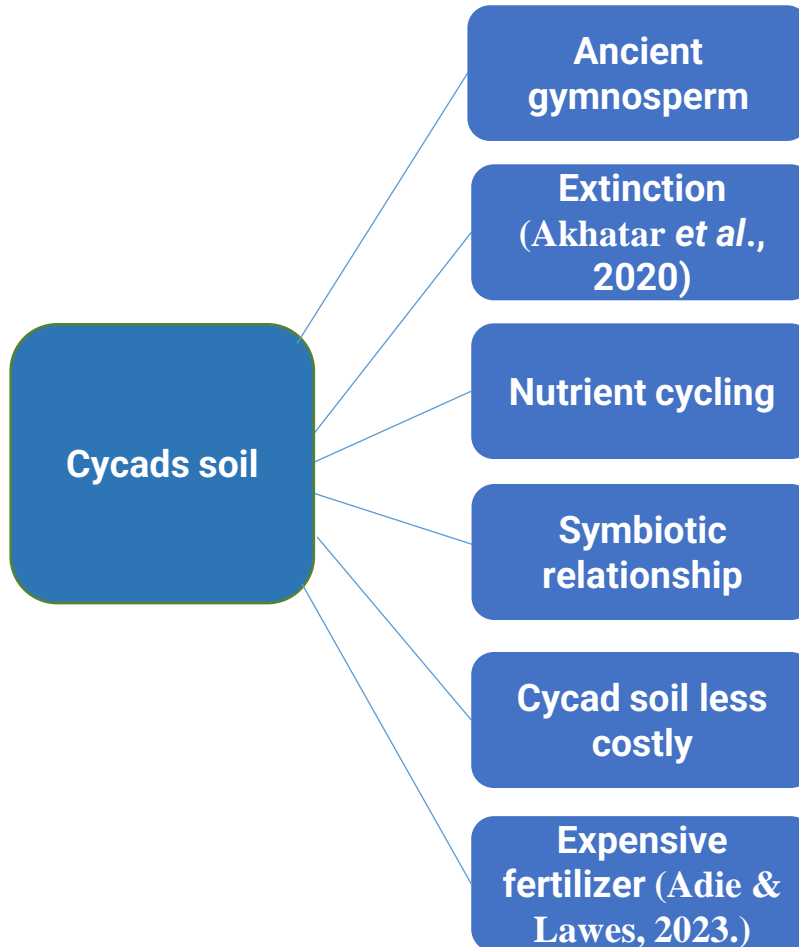


Figure 1: Cycad plant (Etiene, 2021).

**Objective:** To determine the effects of cycad soil on growth and yield of Swiss chards and Mustard.



# Materials and methods

- Randomized Complete Block Design (RCBD)

Design

- Plant variables
  - 1<sup>st</sup> cycle
  - 2<sup>nd</sup> cycle

Data collection

- The experiments will be replicated 5 times

Replication

Layout

- 2x2x3 factorial experiment

Data analysis

- Spinach and mustard
- Cycad (*Encephalartos vellosus*) and non-cycad soil.
- Three level of LAN (28) fertilizer  
0 g, 21.21 g/pot, and 42.24 g/pot

- ANOVA (analysis of variance).
- Fishers least significant difference  $P \leq 0.05$



## Results and discussion

Table 1: Effects of soil and fertilizer on chlorophyll content and root fresh mass.

Soil	Chlorophyll content (cci)			Root fresh mass(g)		
	Fertilizer (g/pot)					
	0	1/2	1	0	1/2	1
Cycad	1.16 <sup>ab</sup> (20.30)	1.23 <sup>a</sup> (18.98)	1.00 <sup>b</sup> (17.00)	6.29 <sup>ab</sup> (6.29)	10.26 <sup>a</sup> (10.26)	8.53 <sup>ab</sup> (8.53)
Non-cycad	1.22 <sup>a</sup> (20.73)	1.12 <sup>ab</sup> (17.78)	1.16 <sup>ab</sup> (18.65)	8.37 <sup>b</sup> (8.37)	7.36 <sup>ab</sup> (7.36)	6.13 <sup>b</sup> (6.63)
F-values		3.11			3.35	
P-values		0.05*			0.05*	
LSD <sub>0.05</sub>		1.37			1.52	

\*Significant  $p \leq 0.05$ ; Means in columns that are followed by the same letters are not statistically different  $p \leq 0.05$ ; Values that are found in brackets are untransformed means [Log (x+1)]. 0= 0 g/pot, 1/2 = 21.12 g/pot and 1= 42.24 g/pot.



## Results and discussion

Table 2: Effect of growth cycle, mustard and Swiss chard on number of leaves and chlorophyll content.

Growth cycle	Number of leaves		Chlorophyll content (cci)	
	Mustard	Swiss chard	Mustard	Swiss chard
1	0.73 <sup>a</sup> (4.36)	0.72 <sup>ab</sup> (4.14)	1.27 <sup>b</sup> (18.14)	1.23 <sup>b</sup> (15.88)
2	0.70 <sup>b</sup> (4.14)	0.73 <sup>a</sup> (4.57)	1.25 <sup>b</sup> (17.64)	1.37 <sup>a</sup> (23.96)
F-value	5.33		27.08	
P-value	0.02*		0.00**	
LSD <sub>0.05</sub>	0.01		0.02	

\*Significant  $p \leq 0.05$ , \*\*Highly significant  $p \leq 0.05$ , Means in columns that are followed by the same letters are not statistically different  $p \leq 0.05$ ; Values that are found in brackets are untransformed means  $[\text{Log}(x+1)]$ .



## Results and discussion

Table 3: Effects of Swiss chard and mustard and fertilizer on number of leaves.

		Number of leaves	
		Fertilizer(g/pot)	
Leafy green	0	½	1
Swiss chard	0.72 <sup>abc</sup> (6.30)	0.71 <sup>bc</sup> (6.20)	0.75 <sup>a</sup> (6.20)
Mustard	0.73 <sup>ab</sup> (6.40)	0.72 <sup>abc</sup> (6.00)	0.70 <sup>c</sup> (5.70)
F-value		5.35	
P-value		0.01 **	
LSD <sub>0.05</sub>		0.02	

\*Highly significant  $p \leq 0.05$ , Means in columns that are followed by the same letters are not statistically different  $p \leq 0.05$  Values

that are found in brackets are untransformed means [Log (x+1)]. 0= 0 g/pot, ½ = 21.12g/pot and 1= 42.24 g/pot



## Results and discussion

Table 4: Effects of leafy vegetables, soil and fertilizer on the leaf fresh mass.

		Leaf fresh mass (g)		
		Fertilizer (g/pot)		
Leafy vegetables	Soil	0	½	1
Swiss chard	Cycad	21.3 <sup>bcd</sup> (21.31)	24.99 <sup>bcd</sup> (24.99)	33.96 <sup>ab</sup> (33.96)
Swiss chard	Non-cycad	19.70 <sup>cd</sup> (19.67)	26.86 <sup>bcd</sup> (26.86)	22.97 <sup>bcd</sup> (22.97)
Mustard	Cycad	29.29 <sup>abcd</sup> (29.29)	41.70 <sup>a</sup> (41.47)	33.93 <sup>ab</sup> (33.93)
Mustard	Non-cycad	31.70 <sup>abc</sup> (31.70)	17.90 <sup>d</sup> (17.90)	31.17 <sup>abcd</sup> (31.17)
F-value			3.74	
P-value			0.03*	
LSD <sub>0.05</sub>			6.71	

\* Significant  $p \leq 0.05$ , Means in columns that are followed by the same letters are not statistically different ( $p \leq 0.05$ ); Values that are found in brackets are untransformed means [Log (x+1)].

0= 0 g/pot, ½ = 21.12 g/pot and 1= 42.24 g/pot



# Results and discussions

Table 5: Effects of growth cycles, mustard and swiss chard, soil, and fertilizer on fresh leaf mass.

		Leaf fresh mass			
		Fertilizer (g/pot)			
Growth cycle	Leafy vegetables	Soil	0	½	1
1	Swiss chard	Cycad	0.46 <sup>cdef</sup> (2.08)	0.54 <sup>cdef</sup> (2.51)	0.32 <sup>f</sup> (1.25)
1	Swiss chard	Non-cycad	0.39 <sup>ef</sup> (1.78)	0.37 <sup>ef</sup> (2.40)	0.51 <sup>cdef</sup> (2.91)
1	Mustard	Cycad	0.53 <sup>cdef</sup> (2.44)	0.67 <sup>cd</sup> (3.69)	0.73 <sup>a</sup> (4.78)
1	Mustard	Non-cycad	0.60 <sup>cde</sup> (3.21)	0.43 <sup>def</sup> (2.25)	0.64 <sup>cd</sup> (3.65)
2	Swiss chard	Cycad	1.35 <sup>ab</sup> (21.31)	1.40 <sup>ab</sup> (26.67)	1.52 <sup>a</sup> (33.96)
2	Swiss chard	Non-cycad	1.18 <sup>b</sup> (19.67)	1.38 <sup>ab</sup> (24.82)	1.20 <sup>b</sup> (22.97)
2	Mustard	Cycad	1.47 <sup>a</sup> (29.29)	1.61 <sup>a</sup> (41.47)	1.51 <sup>a</sup> (33.93)
2	Mustard	Non-cycad	1.51 <sup>a</sup> (31.70)	1.16 <sup>b</sup> (17.90)	1.49 <sup>a</sup> (31.17)
F - value				3.06	
P - value				0.05*	
LSD <sub>0,05</sub>				0.15	

\* Significant  $p \leq 0.05$ , Means in columns that are followed by the same letters are not statistically different ( $p \leq 0.05$ ); Values that are found in brackets are untransformed means [Log (x+1)].

0= 0 g/pot, ½ = 21, 12 g/pot and 1= 42,24 g/pot





## Results and discussions

Table 6: Effect of growth cycles on plant height, chlorophyll content, and leaf fresh mass.

Growth cycle	Plant height (cm)	Chlorophyll content (cci)	Leaf fresh mass (g)
1	1.29 <sup>b</sup> (13.48)	1.25 <sup>b</sup> (17.01)	0.52 <sup>b</sup> (2.75)
2	1.33 <sup>a</sup> (21.69)	1.31 <sup>a</sup> (20.80)	1.40 <sup>a</sup> (27.90)
F-value	5.39	15.26	500.68
P-value	0.02*	0.00**	0.00**
LSD <sub>0.05</sub>	0.01	0.02	0.04

Significant  $p \leq 0.05$ , \*\* Highly significant  $p \leq 0.05$ , Means in columns that are followed by the same letters are not statistically different  $p \leq 0.05$ ; Values that are found in brackets are untransformed means [Log (x+1)].



## Results and discussions

Table 7: Effects of swiss chard and mustard on leaf fresh mass, chlorophyll content, and stem diameter.

Leafy green	Leaf fresh mass (g)	Chlorophyll content (cci)	Stem diameter (mm)
Swiss chard	24.96 <sup>b</sup> (24.96)	1.21 <sup>a</sup> (18.82)	10.07 <sup>a</sup> (10.63)
Mustard	30.91 <sup>a</sup> (30.91)	1.08 <sup>b</sup> (11.62)	7.53 <sup>b</sup> (7.53)
F-value	4.72	8.98	11.87
P-value	0.04*	0.01**	0.00**
LSD <sub>0.05</sub>	2.74	0.05	0.73

Significant  $p \leq 0.05$ , \*\* Highly significant  $p \leq 0.05$ ; Means in columns that are followed by the same letters are not statistically different  $p \leq 0.05$ ; values that are found in brackets are untransformed means [Log (x+1)].



# Results and discussions

Table 8: Effects of soil on leaf fresh mass, plant height, and stem diameter.

Soil	Leaf fresh mass (g)	Plant height (cm)	Stem diameter(mm)
Cycad	30.82 <sup>a</sup> (30.82)	1.64 <sup>a</sup> (42.57)	9.55 <sup>a</sup> (9.54)
Non-cycad	25.05 <sup>b</sup> (25.05)	1.54 <sup>b</sup> (36.95)	8.05 <sup>b</sup> (8.05)
F-value	4.45	5.56	4.12
P-value	0.04*	0.02*	0.05*
LSD <sub>0.05</sub>	2.73	0.04	0.74

Significant  $p \leq 0.05$ ; Means in columns that are followed by the same letters are not statistically different ( $p \leq 0.05$ ); Values that are found in brackets are untransformed means [Log (x+1)].



# Results and discussions

Table 9: Effects of Fertilizer on chlorophyll content

Fertilizer (g/pot)	Chlorophyll content (cci)
0	1.31 <sup>a</sup> (18.02)
1/2	1.27 <sup>b</sup> (16.11)
1	1.26 <sup>b</sup> (11.54)
F-value	3.86
P-value	0.02*
LSD <sub>0.05</sub>	0.01

Means in columns that are followed by the same letters are not statistically different ( $p \leq 0.05$ ); Values that are found in brackets are untransformed means [Log (x+1)]. 0= 0g/pot, 1/2 = 21, 12 g/pot and 1= 42,24 g/pot



## Conclusions and recommendations



*E. VILLOSUS* SOIL IMPROVED  
GROWTH AND YIELD



CYCAD SOIL WITH LAN (28)  
FERTILIZER



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# Thank you for your attention!

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