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Section A: Environmental Science

Research Article

## Effect of Adding Nitrogen, Phosphorous and Potassium to the Seedlings of *Eucalyptus Camaldulensis* in Silt Soil

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**Abstract:** The objectives of the study are to find out the effect of Nitrogen, Phosphorous and Potassium (NPK) when added to the silt soil during the growing of *Eucalyptus camaldulensis*. The materials used consist of silt soil, sand soil, sieved with 2 mm opening, sensitive balance for weighting the matters used in the experiment, twelve polythene tubes with 40 × 60 cm and forty eight seedlings of *Eucalyptus camaldulensis*. Vernier is used for measuring the stems diameter, ruler for measuring the length of the stems and the length of the roots. Oven dry is used with temperature of  $103 \pm 2$  °C degrees. Three samples were chosen that are: sample (A) contains silt as control, sample (B) contains mixed silt soil and three grams of (NPK) and sample (C) is a mixture of silt soil, sand soil and three grams of (NPK). The results explain that, sample (A) gives better growing in seedlings than sample (B) and sample (C).

**Keywords:** Growing, irrigation, sand, seedlings and silt.

## INTRODUCTION

*Eucalyptus camaldulensis* it is known as (River Red gum) is a tree of the genus *Eucalyptus*. Its family is *Myrtaceae*. It is a plantation species in many parts of the world, but is native to Australia, where it has the most widespread natural distribution of *Eucalyptus* in Australia, especially beside inland water courses. It is a familiar and iconic tree seen along many watercourses right across inland Australia. The tree produces shade in the extreme temperatures of central Australia, and plays an important role in destabilizing river banks. *Eucalyptus camaldulensis* consists of two variations and one subspecies: *E. camaldulensis* var. *camaldulensis*, and *E. camaldulensis* var. *obtusa*. The subspecies *Eucalyptus simulata*, is found in North Queensland, has been recognized as a hybrid of var. *obtusa* and *Eucalyptus tereticornis*<sup>2</sup>. The tree can grow to 45 meters (148 ft) tall; it has smooth bark, ranging in color from white and grey to red-brown, which is shed in long ribbons. The tree has a large, dense crown of leaves. The base of the bole can be covered with rough, reddish-brown bark. The juvenile and adult leaves are stalked with the adult leaves broad at the base, tapering to the tip. The adult leaf color is a dull blue-green. The leaf also contains many oil-producing glands in the un-veined areas of the leaf<sup>3</sup>.

All plants require the major nutrients to be freely available in the soil and ready to absorb Nitrogen, Phosphorous and Potassium which are commonly known as the NPK<sup>5</sup>. Also Gregory<sup>1</sup> stated that the nutrients uptake is closely related to plant demand. Especially during vegetative growth. Nitrogen is important for the production of green tissue giving plants a healthy deep green color. It also promotes stem and leaf growth.

All growing plants require some levels of Nitrogen because without it the nitrogen deficiency will soon show up as the plants become stunted and yellow looking with the leaves at the bottom of the plants eventually drying up and withering. Nitrogen is also undesirable as too much stem and leaf growth will lead to soft tissue which leaves the plants vulnerable to disease. Phosphorous or a phosphate affects the root builders and is essential for the development of a strong and healthy root system. This item is also important for young plants or seedlings.

A deficiency of phosphate may be indicated in plants when the foliage becomes blue/grey shade of green. Potassium or Potash is the element that develops fruit and flowers and toughens up the plants making them much more resistant to diseases. Potash plays an important part in the formation of sugars and starches which can be stored by the plant in swollen roots. A deficiency of Potash shows first as yellowing of the leaf margins which may later turn brown and scorched looking. Another important point to remember with Potash is that if you apply too much to the plants it can cause them to absorb too much water.

Silt, deposited by annual floods along the Blue Nile, created the rich, fertile soil<sup>4</sup>. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. The composition of sand varies, depending on the local rock sources and conditions the most common constituent of sand inland continental settings and non-tropical coastal settings is silica (Silicon dioxide, or SiO<sub>2</sub>), usually in the form of quartz. The second most common type of sand is calcium carbonate<sup>4</sup>.



Figure (1): Silt soil (Source: Wikipedia, 2014)



Figure (2): Sand soil (Source: Wikipedia, 2014)

## METHODOLOGY

### A. Materials:

- Nitrogen, phosphorus and potassium.
- Three types of soils: pure silt, silt + NPK and silt + sand +NPK.
- Sieve with 2 mm opening.
- Sensitive balance.
- 12 Polythene tubes with 40 cm × 60 cm.
- 48 seedlings of *Eucalyptus camaldulensis*.
- Ruler for measuring the length of stems and length of roots.
- Vernier for measuring the diameter of a stem.
- Oven dry with a temperature of  $103 \pm 2$  °C.

### B. Experiment:

The experiment was carried out in the Laboratory of the College of Forestry and Range Science in collaboration with the Nursery of Seeds Center located in Soba, Khartoum, Sudan. The method of complete randomizing design was used.

Step 1: the silt and sand soils were sieved using the sieved with 2 mm opening.

Step 2: three samples were selected as follows:

Sample A, contains pure silt (control).

Sample B, contains silt + NPK (3 grams).

Sample C, contains mixture of silt+sand+NPK (3 grams).

- ❖ Every sample has four polythene tubes, and then the three samples are prepared according to the design of the experiment.
- ❖ Four seedlings of *Eucalyptus camaldulensis* were planted in each polythene tubes.
- ❖ The seedlings were irrigated every 48 hours.

### C. Measurement and weighting of seedlings:

The first measurement and weighting of seedlings were carried out after 20 days from the date of seedlings planting the seedlings. The second measurement was conducted after 30 days and the third

measurements and weighting took place after 10 days. In each sample the stem length, root length and diameter were measured while the stem and root wet and dry were weighted. The measurements and weighting continued for two months. Tables (1-14).

## RESULTS

**Table-1:** First measurements and weights of sample (A)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	56	48	58	<b>52</b>	214	53.5
Length of root (cm)	13	14	15.5	10	52.5	13.13
Stem diameter (cm)	3.15	3.25	4.15	4.10	14.65	3.66
Stem wet weight (gram)	6.14	3.73	7.91	3.98	21.75	5.44
Root wet weight (gram)	0.47	0.40	1.22	0.48	2.46	0.62
Stem dry weight (gram)	2.04	1.28	2.53	1.4	7.21	1.80
Root dry weight (gram)	0.18	0.15	0.45	0.15	0.93	0.23

Source: Researchers, 2014

**Table-2:** Second measurements and weights of sample (A)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	72	68	60	47	247	61.75
Length of root (cm)	22	13	13	21.5	69.5	17.38
Stem diameter (cm)	4.35	3.41	4.21	3.24	15.21	3.80
Stem wet weight (gram)	11.09	6.31	9.90	7.93	35.24	8.81
Root wet weight (gram)	3.01	0.92	1.23	1.72	7.00	1.74
Stem dry weight (gram)	3.68	2.06	3.24	2.84	11.82	2.96
Root dry weight (gram)	1.08	0.32	0.44	2.53	2.53	0.63

Source: Researchers, 2014

**Table-3:** Third measurements and weights of sample (A)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	78	58	52.8	82	270	67.62
Length of root (cm)	16	24	15.5	21.5	87	21.75
Stem diameter (cm)	11.74	6.67	6.48	11.39	36.28	9.10
Stem wet weight (gram)	1.45	2.83	1.10	1.25	6.63	1.65
Root wet weight (gram)	4.25	3.21	4.21	4.25	15.92	3.98
Stem dry weight (gram)	5.40	2.73	3.12	5.05	19.40	4.80
Root dry weight (gram)	0.58	1.06	0.43	0.46	2.53	0.63

Source: Researchers, 2014

**Table-4:** Third measurements and weights of sample (B)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	42	58	44	53	235	58.75
Length of root (cm)	14.5	14.5	16	20.5	60	15
Stem diameter (cm)	3.24	3.24	3.15	3.20	38.22	9.56
Stem wet weight (gram)	3.24	4.69	4.15	4.95	5.68	1.42
Root wet weight (gram)	0.51	1.35	0.52	0.94	14.47	3.62
Stem dry weight (gram)	1.26	1.82	1.48	1.76	15.32	3.83
Root dry weight (gram)	0.21	0.42	0.21	0.38	2.07	0,52

Source: Researchers, 2014

**Table-5:** Second measurements and weights of sample (A)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	58	58	0.0	63	179	44.75
Length of root (cm)	16	13.5	0.0	20.3	49.80	12.45
Stem diameter (cm)	4.2	3.21	0.0	3.23	10.65	2.66
Stem wet weight (gram)	6.15	6.14	0.0	9.19	21.48	5.37
Root wet weight (gram)	1.09	0.95	0.0	1.43	3.40	0.80
Stem dry weight (gram)	2.33	2.02	0.0	2.81	9.10	2.28
Root dry weight (gram)	0.42	0.36	0.0	0.51	0.50	0.13

Source: Researchers, 2014

**Table-6:** Second measurements and weights of sample (B)

Description	Samp.A1	A2	A3	A4	Total	Average
Length of stem (cm)	58	58	0.0	63	179	44.75
Length of root (cm)	16	13.5	0.0	20.3	49.80	12.45
Stem diameter (cm)	4.2	3.21	0.0	3.23	10.65	2.66
Stem wet weight (gram)	6.15	6.14	0.0	9.19	21.48	5.37
Root wet weight (gram)	1.09	0.95	0.0	1.43	3.40	0.80
Stem dry weight (gram)	2.33	2.02	0.0	2.81	9.10	2.28
Root dry weight (gram)	0.42	0.36	0.0	0.51	0.50	0.13

Source: Researchers, 2014

**Table-7:** First measurements and weights of sample (B)

Description	Samp.B1	B2	B3	B4	Total	Average
Length of stem (cm)	78	70	0.0	87	197	49.25
Length of root (cm)	19	20	0.0	21	65.5	16.40
Stem diameter (cm)	11.05	14.49	0.0	12.68	12.83	3.21
Stem wet weight (gram)	1.88	2.31	0.0	1.49	17.02	4.23
Root wet weight (gram)	4.25	5.10	0.0	5.12	3.33	0.83
Stem dry weight (gram)	4.63	5.40	0.0	5.11	6.31	1.58
Root dry weight (gram)	0.71	0.85	0.0	0.50	1.22	0.30

Source: Researchers, 2014

**Table-8:** First measurements and weights of sample (C)

Description	Samp.C1	C2	C3	C4	Total	Average
Length of stem (cm)	50	38	41	58	187	46.75
Length of root (cm)	18	22	22	18	80	20
Stem diameter (cm)	3.21	3.14	2.12	3.12	11.59	2.89
Stem wet weight (gram)	6.41	3.37	4.18	8.45	18.40	4.60
Root wet weight (gram)	0.56	0.60	0.44	1.03	2.63	0.65
Stem dry weight (gram)	1.51	1.54	1.34	2.83	7.21	1.80
Root dry weight (gram)	0.24	0.28	0.27	0.39	1.18	0.29

Source: Researchers, 2014

**Table-9:** Second measurements and weights of sample (C)

Description	Samp.C1	C2	C3	C4	Total	Average
Length of stem (cm)	43	37	0.0	48	128	32
Length of root (cm)	13	18	0.0	19	50	12.5
Stem diameter (cm)	2.45	3.24	0.0	2.11	7.8	1.95
Stem wet weight (gram)	3.51	6.15	0.0	7.14	16.80	4.20
Root wet weight (gram)	0.71	1.23	0.0	1.65	3.60	0.90
Stem dry weight (gram)	1.08	2.44	0.0	5.78	5.78	1.44
Root dry weight (gram)	0.33	0.54	0.0	0.61	1.48	0.37

Source: Researchers, 2014

**Table-10:** Third measurements and weights of sample (C)

Description	Samp.C1	C2	C3	C4	Total	Average
Length of stem (cm)	71	49	0.0	0.0	120	30
Length of root (cm)	18	18	0.0	0.0	36	9
Stem diameter (cm)	9.32	4.66	0.0	0.0	13.10	3.48
Stem wet weight (gram)	1.87	0,55	0.0	0.0	2.42	0.61
Root wet weight (gram)	5.15	3.25	0.0	0.0	8.4	2.1
Stem dry weight (gram)	3.91	1.70	0.0	0.0	5.61	1.40
Root dry weight (gram)	0.71	0.23	0.0	0.0	0.93	0.23

Source: Researchers, 2014

**Table-11:** Average of three treatments for sample (A)

Description	Treatments				Average
	First	Second	Third	Total	
Length of stem (cm)	53.5	61.75	67.63	182.88	60.96
Length of root (cm)	11.13	17.38	21.75	50.26	16.75
Stem diameter (cm)	3.66	3.88	9.10	16.64	5.55
Stem wet weight (gram)	5.44	8.89	1.933	16.26	5.42
Root wet weight (gram)	0.62	1.74	3.98	6.34	2.11
Stem dry weight (gram)	1.80	2.96	4.11	8.87	2.96
Root dry weight (gram)	0.23	0.81	0.62	1.66	0.55

Source: Researchers, 2014

**Table-12:** Average of three treatments for sample (B)

Description	Treatments				Average
	First	Second	Third	Total	
Length of stem (cm)	49.25	44.75	58.75	152.75	50.92
Length of root (cm)	16.37	12.45	15	43.82	14.61
Stem diameter (cm)	3.21	2.67	9.10	14.98	4.99
Stem wet weight (gram)	4.26	5.37	1.42	11.05	3.68
Root wet weight (gram)	0.83	1.06	3.62	5.51	1.84
Stem dry weight (gram)	1.58	1.80	3.83	7.21	2.40
Root dry weight (gram)	0.30	0.55	0.52	1.37	0.46

Source: Researchers, 2014

**Table-13:** Average of three treatments for sample (C)

Description	Treatments				Average
	First	Second	Third	Total	
Length of stem (cm)	46.75	32.00	30.00	108.75	36.25
Length of root (cm)	20.00	12.50	30.00	20.83	6.94
Stem diameter (cm)	2.89	1.95	3.50	8.34	2.78
Stem wet weight (gram)	4.60	4.22	0.61	9.43	3.14
Root wet weight (gram)	4.26	4.22	0.61	9.43	3.14
Stem dry weight (gram)	1.80	1.44	1.40	4.64	1.55
Root dry weight (gram)	0.29	0.37	0.23	0.89	0.30

Source: Researchers, 2014

**Table-14:** Final summary of the three samples

Description	Sample (A)	Sample (B)	Sample (C)
Length of stem (cm)	60.96	50.92	36.25
Length of root (cm)	16.75	14.61	6.94
Stem diameter (cm)	5.55	4.99	2.78
Stem wet weight (gram)	5.42	3.68	3.14
Root wet weight (gram)	2.11	1.84	3.14
Stem dry weight (gram)	2.96	2.40	1.55
Root dry weight (gram)	0.55	0.46	0.30

Source: Researchers, 2014

## DISCUSSION

The results indicated that, the average lengths of the stems, roots and stem diameter in sample A are greater than samples B and C which are equal to 36.96 cm, 16.75 and 5.55cm respectively. The weight of wet stem gave greater weight than sample B and C that is equal to 5.55 grams. While sample C shows the higher weight in wet root which is equal to 3.14cm. On the other hand the weight of dry stem and root is also greater in sample A, which is 2.96 grams. The results show that, the planting of seedlings in silt soil is better than planting them in mixture soil of (silt + NPK) and (silt + NPK + sand). This result is the same as stated by Moss 4. The results also show that there are no wide differences between the treatments

## RECOMMENDATIONS

The study has come up with the following recommendations:

- ❖ Silt soil is rich with Nutrients; therefore it does not require the addition of the nutrients of Nitrogen, Phosphate and Potassium (NPK) needed for seedlings growing.
- ❖ Silt soil must be used for germination of the seeds and growing of the seedlings.



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