The soil quality and heavy metal contamination in relation to the growth of Monthong Durio (Durio zibethinus Murray) and Blackthorn Durio Baan Huay Sri Kesorn area and Baan Larn Khoi area, Paphayom, Phatthalung.

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Abstract

Title: The quality of soil and its heavy metal accumulation in relation to the growth of Monthong Durio (Durio zibethinus murray) and Blackthorn Durio Baan Huay Sri Kesorn area and Baan Larn Khoi area, Paphayom District, Phatthalung Province.

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Abstract

This research is a studying about the soil quality with heavy metal in contaminated soil in relation to the growth of Monthony durian and Blackthorn durian under the same tending. For use as information on tending with improvement development the soil quality to durian. Which a studying about durian tree 2 point to durian yields 11 months. Which the spraying for tending every week. Already quantitative soil temperature, soil moisture and heavy metal in contaminated of soil such as Arsenic(As), , Chromium(Cr), Lead(Pb) by using ICP-OES, spray chemical fertilizer and quantitative vegetative in September, October, November to once a moth.

The result found that, soil temperature is 26.48, soil moisture is 17.72. Heavy metal are two group. Heavy metal in contaminated of soil are toxic for example Arsenic (As) average is 0.56, Cadmium(Cd) average is 0.03. Heavy metal in contaminated of soil are benefits for example Chromium(Cr) is 5.24 and Lead(Pb) is 3.35. Analysis of the growth of Monthong durian are more then Blackthorn durian both plats. Fisher fertilizer is Arsenic(As) and Cadmium(Cd) than less than the standard but found Chromium(Cd) and Lead(Pb) to helpful. Showed that agriculture can growth some plants to desired Chromium(Cr) is 5.24 and Lead(Pb) insert durian because have minerals residue in the ground.

Key word: Durio zibethinus murray ,ICP-OES **,**Soil quality ,The Heavy Metal Accumulation

Introduction

Durian’s considered a local fruit of the South of Thailand. Durian’s made a killing of farmers. In 2019 the south producers of durian 500,000 tons. Thailand’s exported to China Hongkong and Vietnam.

Planting and tending of durian in relation to soil quality. Ground tending of durian must nutrient. It's put fertilizer. Chemical fertilizer’s heavy metal. It's a danger to health. The authors must study soil quality, heavy metals in contaminated soil, and the growth of Monthong Durian and Blackthorn Durian. For your information of tending.

Research Question

1. How is that quality of soil relation with growth of Monthong Durian and Blackthorn Durian.
2. How is that tending have relation with growth rate of Monthong Durian and Blackthorn Durian.
3. How is that tending rate of Monthong Durian and Blackthorn Durian impact for heavy metals in contaminated soils.

Hypothesis

1. Quality of soil in soil moisture Soil temperature impact for growth of Monthong Durian and Blackthorn Durian those contrast.
2. Tending with spray chemical fertilizer on weekly impact Monthong Durian and Blackthorn Durian for growth rate.
3. spray chemical fertilizer on weekly impact discover heavy metals in contaminated soils , i.e., arsenic(As), Cadmium(Cd), Chromium(Cr), Lead(Pb).

Material and Methods

Study Site

1. Village No.2, Laan Khoi Subdistrict, Pa Phayom District, Phatthalung Province, Miss Thanyarat Chinapan's Durian Garden.
2. House No.10, Village No. 7, Huai Sri Kesar Village, Laan Khoi Subdistrict, Pa Phayom District, Phatthalung Province.

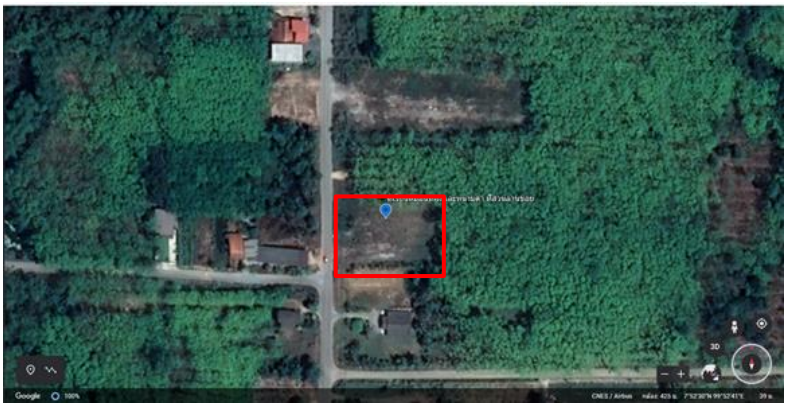

Figure 1 Study point, Laan Khoi Subdistrict, Latitude 7.5227N Longitude 99.5233E metres above sea level 39 m. (website : https://www.google.com/intl/th/earth/)

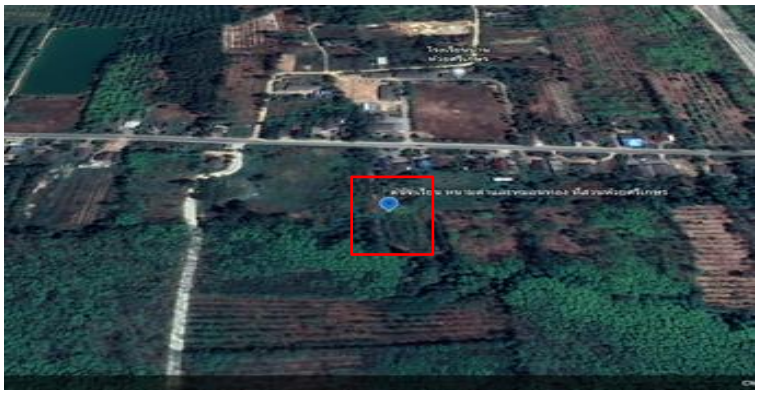

Figure 2 Study point, Baan Huai Sri Gaysorn, Latitude 7.5157N, Longitude 99.5409E metres above sea level 33 m. (website : https://www.google.com/intl/th/earth/)

Factors of the studying

1. Soil quality
2. tendings
3. the growth of durian
4. durian age
5. soil classification
6. what kind of fertilizer to use for durian
7. period of time's the spraying of durian
8. soil contamination

Tools and Methods

1.Tools

1.1 Tools and chemical of soil analysis and air quality

1.1.1 Digital thermometer

1.1.2 Steel tape

1.1.3 Digital scale

1.1.4 Plastic bag (6*12)

1.1.5 Rubber band

1.1.6 Hoe

1.1.7 Hammer

1.1.8 Chemical pen

1.1.9 Aiuminum cup

1.1.10 Soil incubator

1.1.11 Trowel

1.2 Tools of soil extract

1.2.1 Mortar and Pestle

1.2.2 Flour sifter

1.2.3 Spoon

1.2.4 Ziplock

1.2.5 Analytical Balance

1.2.6 Hotplate Stirrer

1.2.7 Erlenmeyer flask 250 cm^3

1.2.8 Beaker 50 ml

1.2.9 Filter papers

1.2.10 Funnel filter polypropylene

1.2.11 Volumetric flask 25 ml

1.2.12 Plastic stopper

1.2.13 Reagent Bottle

1.2.14 Deionized water

1.3 Tools to soil analysis

1.3.1 Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) brand Perkin Elmer modal Avio 200

1.3.2 Deionized water

1.3.3 HNO3 acid (98%) LR grade

1.3.4 Hydrochloric acid (concentrated), HCL

1.3.5 Hydrogen peroxide (30%) ,H2O2

1.3.6 Arsenic standard solution 1000 mg/L

1.3.7 Cadmium standard solution 1000 mg/L

1.3.8 Chromium standard solution 1000 mg/L

1.3.9 Lead standard solution 1000 mg/L

2. Methodology

2.1 Step of research

2.1.1 Area sarvey of Monthong Durian with Blackthorn Durian at orchard Baan Huay Sri Kesorn area and Baan Larn Khoi area.

2.1.2 soil sampling

1) Select durian tree is Monthong Durian with Blackthorn Durian.
2) Collected 8 for one point at 15 cm.deep.Measure soil temperature 3 times per hole and record.
3) Put soil sample in a Plastic bag. Label the bag sampling site, Name of collector, date.

2.1.3 Soil extraction

1) Air-dry the sample under the shade and get pounded thoroughly. Then sieve out the soil. Collect the sieved sample in a Plastic bag. Write a code in front of Plastic bag.
2) Weigh of soil sample 1.0000-2.000 g. Put Erlenmeyer flask 250 cm^3 .Do three time and used reagent bottle blank's sample blank.
3) Add 1 ml of HNO_3. Then shake all ingredients to mix together And close the lid.
4) Bring to heat at 95$\pm$5 °c Celsius for 10-15 minutes. With out boiling, then bring the sample to cool.
5) Add 5 ml of Conc HNO_3 to the flask and heat it at 95±5 °c for 30 minutes to allow the evaporated material to condense back into the container, then set a side to cool.
6) Add 5 ml Conc HND_3 and heat at 95±5 °c until there is no brown smoke and about 5 ml sample volume blot a bout 2 hours then let cool.

7) Add HNO_3 2 ml and 30% H_2O_2 5ml, cover the vial and warn the sample to begin peroxide reaction for 10 minutes – 2 hour. Then let cool.

8) Add conc. HCL 10 ml to the digested sample iin step 7 and Heat it to 95±5 °c then let it Refluxfor 15 minutes. Then let cool.

9) Filter it by filter paper What man No.42 put it in the Volumetric flask 50 ml and adjust the volume with DI. Then poured into plastic bottles for analysis by ICP-OES.

2.1.4 Soil analysis by ICP-OES

1) For standard solution arsenic, cadmium, chromium, lead Prepare standard solution to a concentration of 0.01, 0.05,0.10,0.50,1.00,2.00 ,4.00 mg / L

2) Optimize the instrument analysis methods to suit the sample.

3) System performance testing or Performance check (Mn I ppm).

4) Creatc Calibration Curve and Verified Calibration.

5) Detect LOD/LOQ (if necessary).

6) Analyze samples and control the quality of the analysis.

7) Processing and analysis.

8) Calculate and report the analysis results by sample type.

9) Clean the machine

2.1.5 Study on the growth of durian trees.

1) Measure the height of the plant from the the specified point with a tape measure.

2) Study the age of the durian tree the beginning month of planting.

3) Study of soil types according to the GLOBE methodology

4) Type of fertilizer used Ficher chemical fertilizers are organic and natural supplements.

2.1.6 Measurement air quality

Read temperature from wet dry bulb hygrometer.

2.1.7 Statistes data analysis

Statistes is mean in find the values.

1) How to calculate soil moisture

(weight betove beke – weight after beke) x 100

weight after beke

2) How to calculate precision sciencing.

%RPD = (X1 – X2/X) x 100

When X_1,X_2 = results of the time 1 and 2

X = mean of results to time.

Acceptance testing

%RPD Values is't allowed to axceed 15%. If it's fail criteria. You must retest that sample. If it's fail criteria again. Let find reason and edit before continue.

3) How to calculate recovery

%Recovery = (Spiked Sample value –Initial sample value) x 100

Value of the standard solution added

Acceptance testing

%Recovery Values must be between 80-120%. If it's fail criteria. You must cancel test and retest. And it's fail criteria again. Let find reason and edit before continue.

Results

1. Soil quality with growth of durian.

area	Soil moisture (%)			Soil temperature(°c)			Growth (cm.)(average height)					
							Blackthorn durian			Monthong durian		
	Sep.	Oct.	Nov.	Sep.	Oct.	Nov.	Sep.	Oct.	Nov.	Sep.	Oct.	Nov.
Baan Huay Sri Kesorn	14.9	15.9	23.5	26.3	27.6	23.6	16.7	22	27	11.1	18.7	43.3
Baan Larn Khoi	17.8	17.8	16.4	27.8	28.8	24.8	14	18.3	28.8	16.3	20.3	23.2

The list 1 Show the result of soil moisture, soil temperature and the growth of durian.

The list found that, Baan Huay Sri Kesorn area is soil moisture increases. The growth of durian of bath species is increases isn't related to soil temperature. The growth of durian of bath species of Baan Larn Khoi area isn't related to soil temperature and soil moisture.

2. The growth rate of durian.

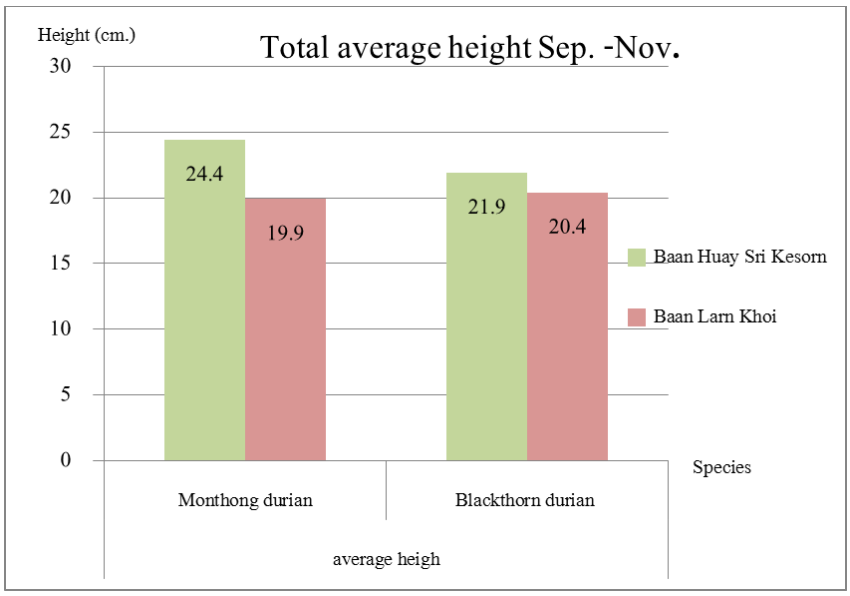

Figure 1 show average height of Monthong durian with Blackthorn durian in Baan Huay Sri Kesorn and Baan Larn Khoi area.

The graph found that, Monthong durian in Baan Huay Sri Kesorn area is outgrow Baan Larn Khoi area .For Blackthorn durian in Baan Huay Sri Kesorn area is the average growth 21.9 cm. and Baan Larn Khoi area is the average growth 20.04 cm.. Showed Baan Larn Khoi area is outgrow Baan Huay Sri Kesorn area.

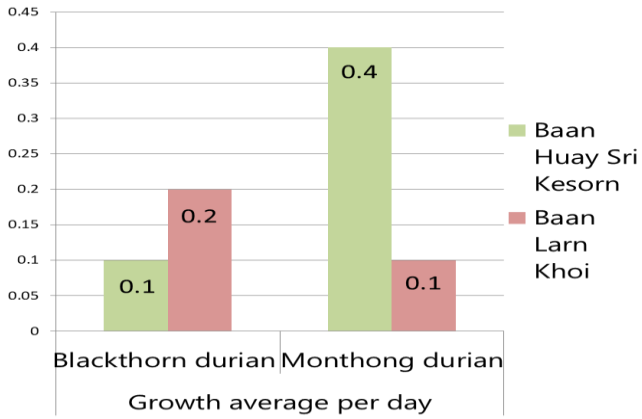

Figure 2 show average height per day of Monthong durian tree with Blackthorn durian thee in Baan Huay Sri Kesorn and Baan Larn Khoi area.

The graph found that, the growth rate of Monthong durian tree in Baan Huay Sri Kesorn area have the growth rate 0.4 cm. per day. Blackthorn durian thee area have the

growth rate mean par day is more than Monthong durian tree in the all area of Baan Huay Sri Kesorn area with Baan Larn Khoi area.

3. Heavy metal in contaminated soil

month	area	Heavy metal in contaminated soil			
		arsenic	cadmium	chromium	lead
Sep.	Huay Sri	< 0.54	< 0.03	9.26	5.84
	Larn Khoi	< 0.56	< 0.03	1.42	0.47
Feb.	Huay Sri	< 0.59	< 0.03	9.06	6.65
	Larn Khoi	< 0.54	< 0.03	1.22	0.42

Figure 2 show mean heavy metal in contaminated soil Baan Huay Sri Kesorn area with Baan Larn Khoi area.

The groph found that, soil have arsenic get below 0.54, cadmium get below 0.03. In September, Baan Huay Sri Kesorn area detected is chromium 9.26 and lead 5.58 are the most of mean.

Discussion and Conclusions

1. The result found that, soil quality relation with growth of Monthong durian tree and Blackthorn durian tree that soil moisture high Monthong durian tree and Blackthorn durian tree have high growth.
2. Tending is relation with growth rate of Monthong durian tree and Blackthorn durian tree that Baan Huay Sri Kesorn area Monthong durian have the most growth rate.
3. Tending is Monthong durian tree and Blackthorn durian tree impact heavy metal in contaminated soil that spraying chemical fertilizer every week impact at Baan Huay Sri Kesorn area have heavy metal in contaminated soil it lower than the difference statistical significance that two area.

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