

Determination of Nutrients in Manure around in Loei Province

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Abstract

The objective of this study was to determine a nutrients (calcium, magnesium, iron, copper, manganese, zinc and potassium) from manure in around Loei province. The manure samples (cow dung, pig dung and buffalo dung) were collected from 14 sample points. The analysis showed that, cow dung from Muang District of Loei province showed the highest of Calcium content of 25.1070 mg/kg. Pig dung from Nonghin District showed the highest of magnesium content of 42.6460 mg/kg. Pig dung from Muang District showed the highest of iron content of 29.0060 mg/kg. Pig dung from Nonghin District showed the highest of copper content of 2.3502 mg/kg. The highest of manganese content found in pig dung from Nonghin District was 29.1599 mg/kg. The highest of zinc content found in pig dung from Nonghin District was 35.2195 mg/kg. The highest of potassium content found in pig dung from Phakhao District was 14.6863 mg/kg. Percent recovery in this study between 80-110 %, it this acceptable. The LOD value and LOQ value of calcium, magnesium, iron, copper, manganese, zinc and potassium was equal to 0.8157- 2.7176, 3.5614 - 11.7927, 0.8332- 2.5902, 0.1221- 0.1907, 0.0487- 0.1572, 0.0618 - 0.1871 and 0.2736 - 0.8854 mg/kg, respectively.

Keyword: Manure, Nutrient, Cow dung, Pig dung, Buffalo dung

1. Introduction

Loei province is located on the plateau. Most of landscape is a long mountain range between northeast to southeast. Most population of Loei province was done agricultural career in intermountain basin such as farmer and agriculture. Soil abundance have involve for agricultural career. When demand for higher agricultural product, the chemical fertilizers is high. Most agriculturist expect to high yield product from agriculture. Thus, chemical fertilizers used in farmer and agriculture. As a results, production cost rise of agriculture and soil pollution from chemical fertilizer residues. Soil degradation has an effect to plants growth. So, solve problem by turning to organic fertilizers. Manure or organic fertilizer such as cow dung, pig dung and buffalo dung which is derived from an animals. Manure includes major nutrients for plants growth in agriculture. Manure finds it easy in animals farming and farmer can make up itself. Especially, use manure makes a reduce production cost in agricultural career and reduce the cost of chemical fertilizers (Bot & Benites, 2005).

Thus, the researcher focus on a major nutrients in manure from pig dung, cow dung and buffalo dung in 14 farming area of Loei province. Major nutrient in this study was

calcium (Ca), magnesium (Mg), iron (Fe), copper (Cu), manganese (Mn), zinc (Zn) and potassium (K).

2. Research Objectives

The analysis of calcium, magnesium, iron, copper, zinc, manganese and potassium in manure from 14 farming area of Loei province.

3. Research Methodology

3.1 Samples manure

The manure samples were collected from the 14 districts of Loei province (Table 1). The manure sample produced from cow, pig and buffalo (Table 1).

*Table 1
The manure samples were collected from 14 districts of loei province*

No.	Sampling points	Symbol		
		cow dung (A)	buffalo dung (B)	pig dung (C)
1	Muang Loei District	A1	B1	C1
2	Naduang District	A2	B2	C2
3	Chiang Khan District	A3	B3	C3
4	Pak Chom District	A4	B4	C4
5	Dan Sai District	A5	B5	C5
6	Naheaw District	A6	B6	C6
7	Phu Rua District	A7	B7	C7
8	Tha Li District	A8	B8	C8
9	Wangsaphung District	A9	B9	C9
10	Pukradueng District	A10	B10	C10
11	Phu Luang District	A11	B11	C11
12	Phakhao District	A12	B12	C12
13	Erawan District	A13	B13	C13
14	Nonghin District	A14	B14	C14

3.2 Materials and Reagent

Atomic absorption spectrophotometer, (Model AA-6200 Shimadzu, Japan), laboratory glassware pyrex, blender, sieve 40 mesh, 65 % nitric acid (HNO₃), 70% perchloric acid (HClO₄), 1,000 ppm of calcium standard solution, 1,000 ppm of magnesium standard solution, 1,000 ppm of iron standard solution, 1,000 ppm of copper standard solution, 1,000 ppm of manganese standard solution, 1,000 ppm of zinc standard solution, potassium dichromate (K₂Cr₂O₇) was obtained from Merck, Germany.

3.3 Sample preparation

One kilogram of various manure samples put in aluminum tray. Removed impurities such as plastic, glass and other metal. Mix and blended the manure sample and filtrate through 40 mesh of sieve. The manure sample are dried at 100 °C and kept at room temperature for next experiments.

3.4 Determination of Nutrient

Add two milligrams of dried manure samples into a test tube digester and mix with 10 mL of HNO₃ in HClO₄ (2:1 ratio). Sample digestion at 220 °C until clear color and cooldown in room temperature. Filtrate manure sample solution through filter membrane and adjust volume with distill water into 50 mL. The manure samples solution was analysis for calcium, magnesium, iron, copper, manganese, zinc and potassium by Atomic Absorption Spectrophotometer (AAS). The amount of nutrients in manure samples was calculate by compare with individuals standard nutrient according to the equation $y = mx + c$ (Vipaporn, 2012).

4. Results

The analysis of major nutrients in various manure from 14 sampling point of Loei province by AAS. The result show that, the amount of Ca content in cow dung (A) between 3.3210 to 25.1070 mg/kg of sample (Figure 1). Whereas, Ca content in buffalo dung (B) between 7.5638 to 23.2195 mg/kg of sample (Figure 1). Calcium content in pig dung (C) between 3.3717 to 21.9204 mg/kg of sample (Figure 1).

1. Calcium (Ca)

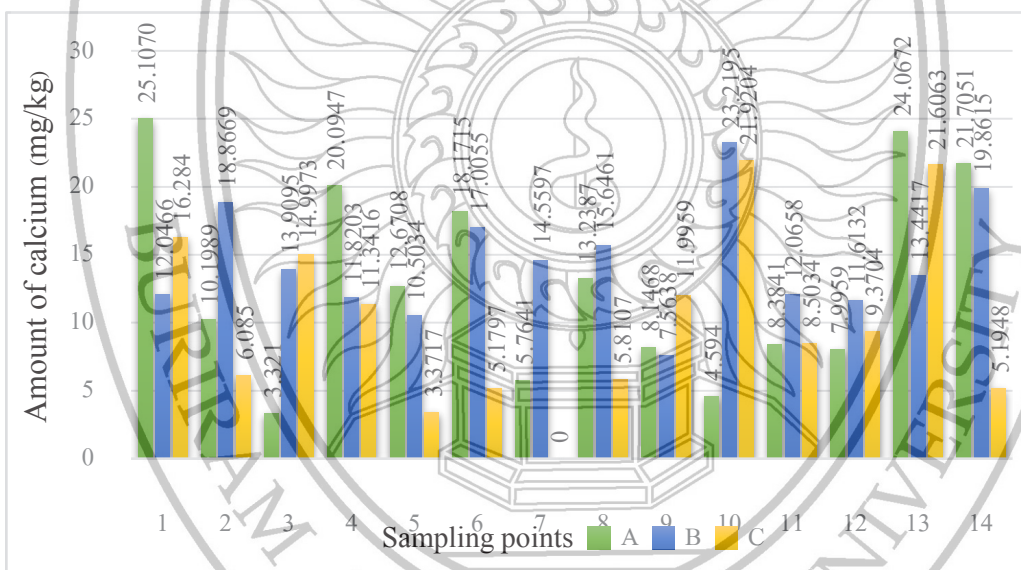


Figure 1. Calcium content in manure sample from 14 sampling point of Loei province

2. Magnesium (Mg)

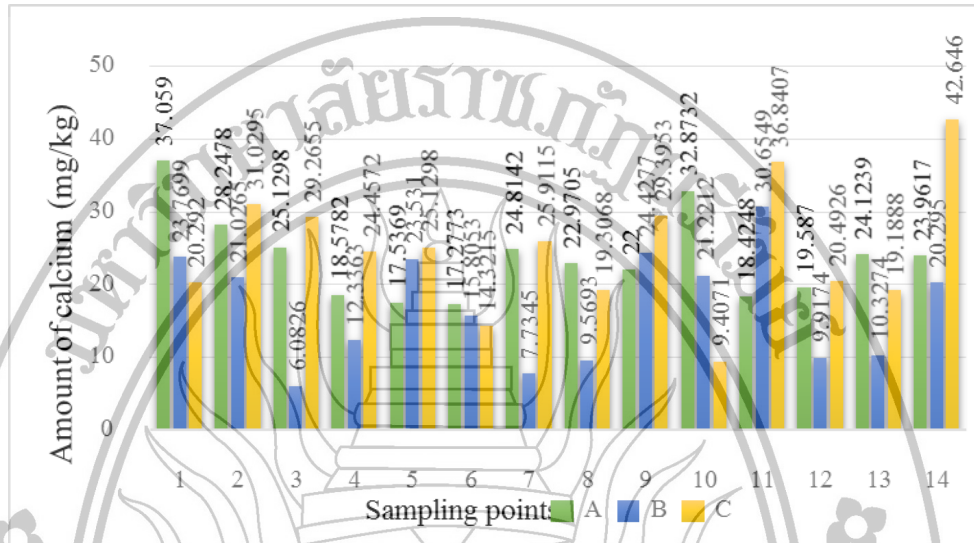


Figure 2. Magnesium content in manure sample from 14 sampling point of Loei province

In figure 2 show the magnesium content in cow dung, buffalo dung and pig dung from 14 sampling point of Loei province. Magnesium content in cow dung (A) between 17.2773 to 37.059 mg/kg of sample. Magnesium content in buffalo dung (B) between 6.0826 to 30.6549 mg/kg of sample. Finally, magnesium content in pig dung (C) between 9.4071 to 42.6460 mg/kg of sample.

3. Iron (Fe)

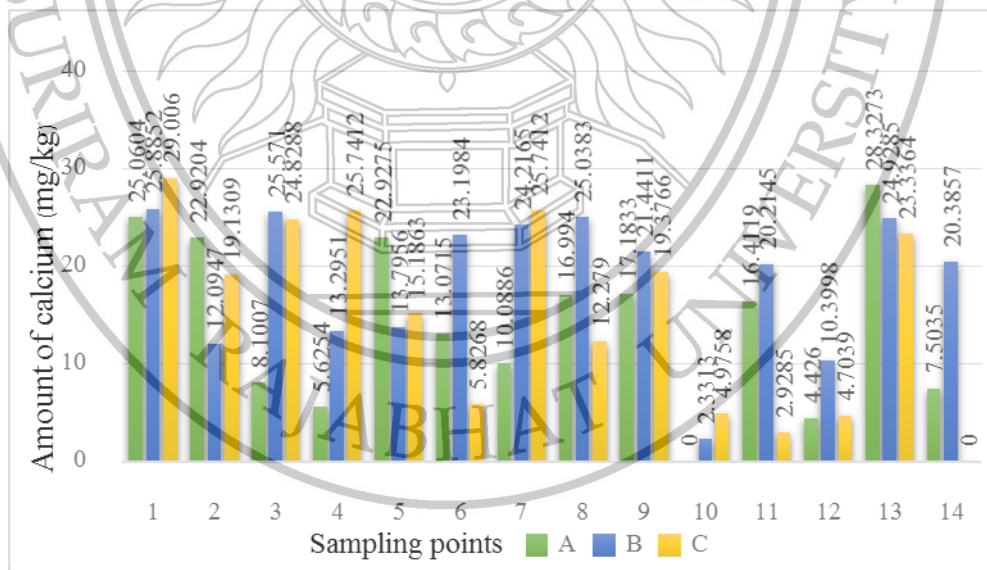


Figure 3. Iron content in manure sample from 14 sampling point of Loei province

The amount of Fe content in cow dung (A) between 0 to 28.3273 mg/kg of sample (Figure 3). Whereas, Fe content in buffalo dung (B) between 2.3313 to 25.8852 mg/kg of sample (Figure 3). Iron content in pig dung (C) between 2.9285 to 29.0060 mg/kg of sample (Figure 3).

4. Copper (Cu)

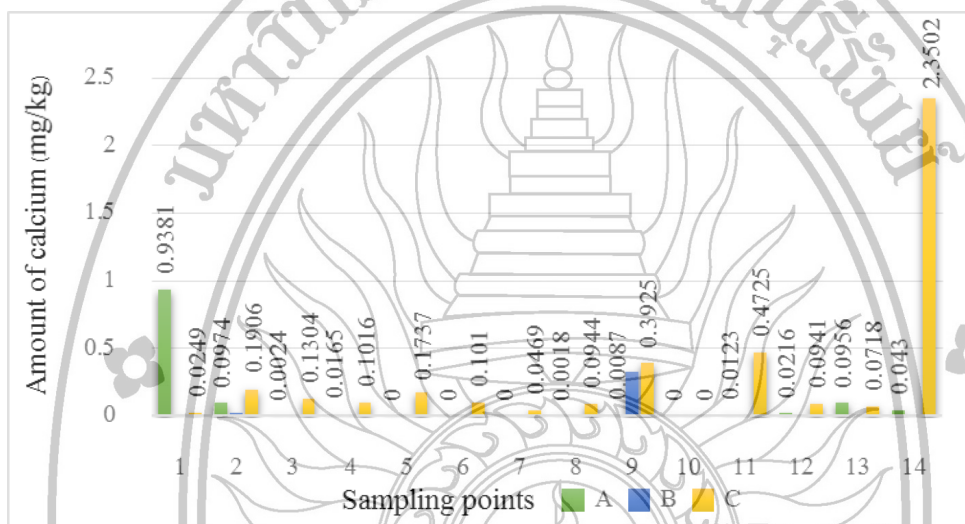


Figure 4. Copper content in manure sample from 14 sampling point of Loei province

In figure 4 show the copper content in cow dung, buffalo dung and pig dung from 14 sampling point of Loei province. Copper content in cow dung (A) between 0 to 0.9381 mg/kg of sample. Copper content in buffalo dung (B) between 0 to 0.3228 mg/kg of sample. Finally, copper content in pig dung (C) between 0 to 2.3502 mg/kg of sample.

The amount of manganese content in cow dung (A) between 26.0316 to 28.4638 mg/kg of sample (Figure 5). Whereas, manganese content in buffalo dung (B) between 0.4634 to 4.6847 mg/kg of sample (Figure 5). Manganese content in pig dung (C) between 25.0187 to 29.1599 mg/kg of sample (Figure 5).

In figure 6 show the zinc content in cow dung, buffalo dung and pig dung from 14 sampling point of Loei province. Zinc content in cow dung (A) between 3.3210 to 20.7737 mg/kg of sample. Zinc content in buffalo dung (B) between 0.0945 to 0.9252 mg/kg of sample. Finally, zinc content in pig dung (C) between 2.2359 to 35.2195 mg/kg of sample.

The amount of potassium content in cow dung (A) between 8.1403 to 13.8770 mg/kg of sample (Figure 7). Whereas, potassium content in buffalo dung (B) between 4.7984 to 14.6863 mg/kg of sample (Figure 7). Potassium content in pig dung (C) between 7.8777 to 14.3491 mg/kg of sample (Figure 7).

5. Manganese (Mn)

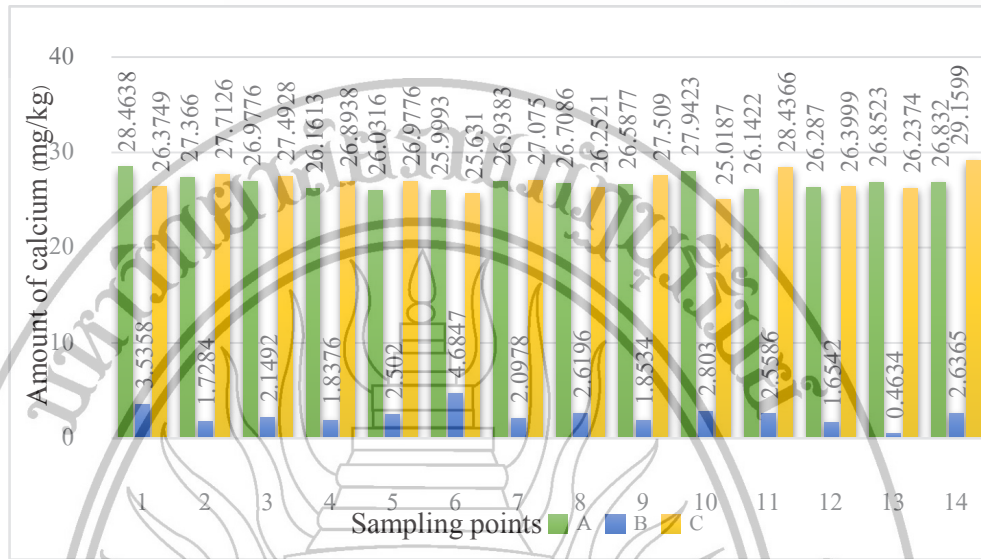


Figure 5. Manganese content in manure sample from 14 sampling point of Loei province

6. Zinc (Zn)

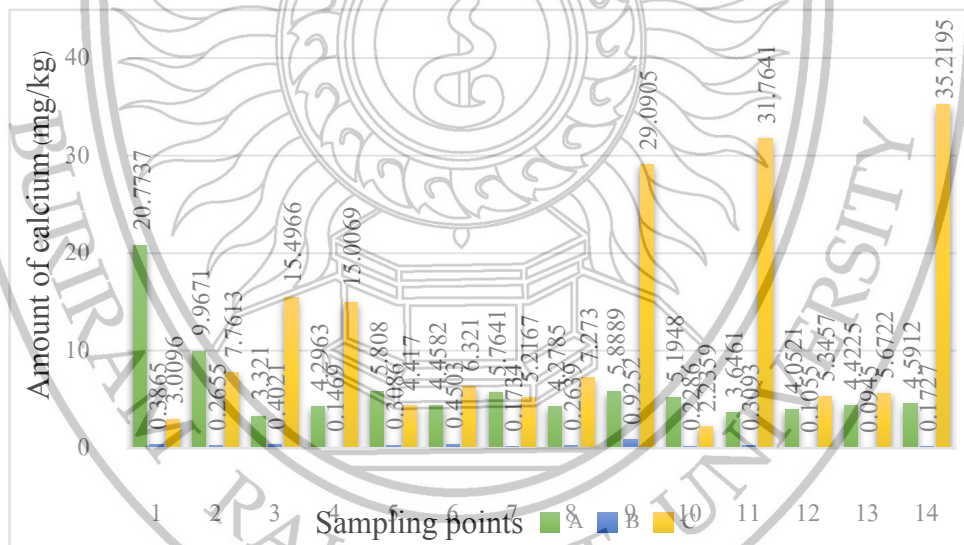


Figure 6. Zinc content in manure sample from 14 sampling point of Loei province

7. Potassium (K)

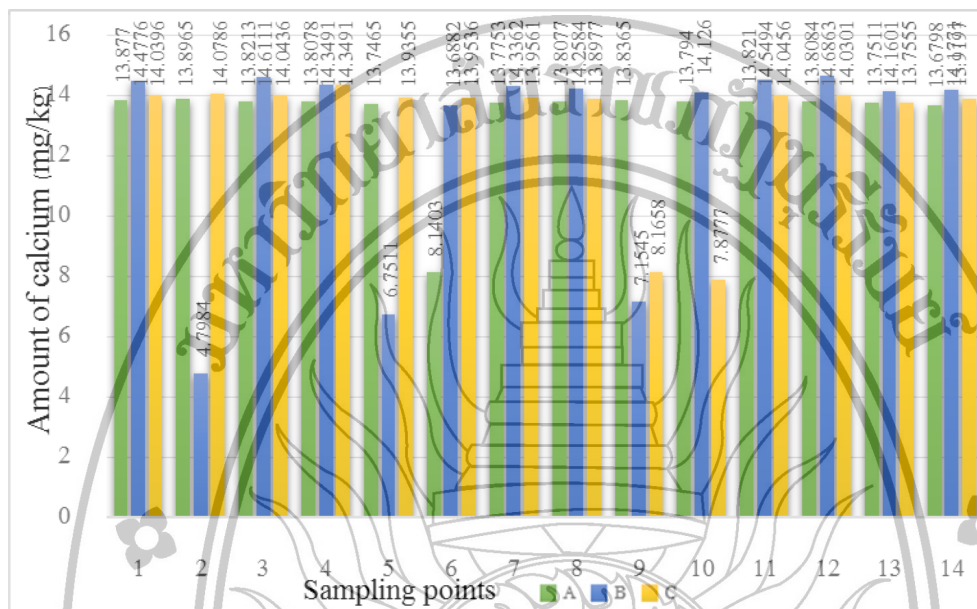


Figure 7. Potassium content in manure sample from 14 sampling point of Loei province

5. Discussion

In this analysis, percent recovery has a rank 80 to 110 %, which is acceptable (data not show). The analysis LOD and LOQ of calcium, magnesium, iron, copper, zinc, manganese and potassium was 0.8157- 2.7176, 3.5614 - 11.7927, 0.8332 - 2.5902, 0.1907 0.1221-, 0.0487- 0.1572, from 0.0618 to 0.1871 and 0.2736 - 0.8854 mg/kg, respectively. The Determination of nutrients in manure samples were collected on 14 sampling points and nutrient content analyzed of Ca, Mg, Fe, Cu, Mn, Ze and K by AAS. The analysis found that, the sampling points at A1 or Muang District have calcium content and iron content higher than the other sampling point (Figure 1 and Figure 3). The sampling points at C14 or Nonghin District have a magnesium content, copper content, manganese content and zinc content higher than the other sampling point (Figure 2, Figure 4, Figure 5 and Figure 6). Sampling point at B12 or Phakhao District has potassium higher than the other sampling point (Figure 7). In this time, the manure sample from pig dung a high nutrient content such as Mg, Cu, Mn and Zn (Figure 2, Figure 4, Figure 5 and Figure 6). It due to animal feed, climate and different farmer in agricultural (Kusuma, 2012). In previously report, showed the nutrient content of manure from pig dung higher than manure from buffalo dung dung (Aeez and Averbake, 2010)

6. Conclusion

The highest of calcium (Ca) content found in cow dung at A1 sampling point of 25.1070 mg/kg. The highest of magnesium (Mg) content found in pig dung at C14 sampling point of 42.6460 mg/kg. The highest of iron (Fe) content found in pig dung at C1 sampling point of 29.0060 mg/kg. The highest of copper (Cu) content found in pig dung at

C14 sampling point of 2.3502 mg/kg. The highest of Manganese (Mn) content found in pig dung at C14 sampling point of 29.1599 mg/kg. The highest of zinc (Zn) content found in pig dung at C14 sampling point of 35.2195 mg/kg. The highest of potassium (K) content found in buffalo dung at B12 sampling point of 2.3502 mg/kg.

7. Recommendations

Before collecting sample should be contact the leader or party in the sampling point area. In nutrients analysis by atomic absorption spectrophotometer should be appropriate select lamp detector.

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