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Determination of Heavy Metals Contamination in Rice Collected from Preah Vihear Province

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INTRODUCTION

- Rice is an important source of energy, vitamins, and minerals that make up over 70% of the daily caloric intake of most people worldwide, especially those in developing Asian countries.
- Rice is possibly contaminating of heavy metal and other toxic substance which is a grave concern for food safety and human health.
- Heavy metals are taken up by plants and deposited in human cells which possibly affecting human health.

OBJECTIVE

Determine the concentration of Iron (Fe), Manganese (Mn), and Arsenic (As) contamination in 48 rice samples harvested from green manual (GM) and conventional tillage (CT) system.

METHODOLOGY

• Sample site

Rice samples were collected from Rovieng District, Preah Vihear Province, which was planted with 4 different treatments, including :

- control (1-T0),
- biochar of HUSK Venture: 2 tons/ha (2-R2),
- biochar of HUSK Venture: 5 tons/ha (3-R5),
- ash of rick husk from Amru rice: 5 tons/ha (4-AHS5).

• Digestion method

Samples were digested by using the Nitric acid and hydrogen peroxide digestion method

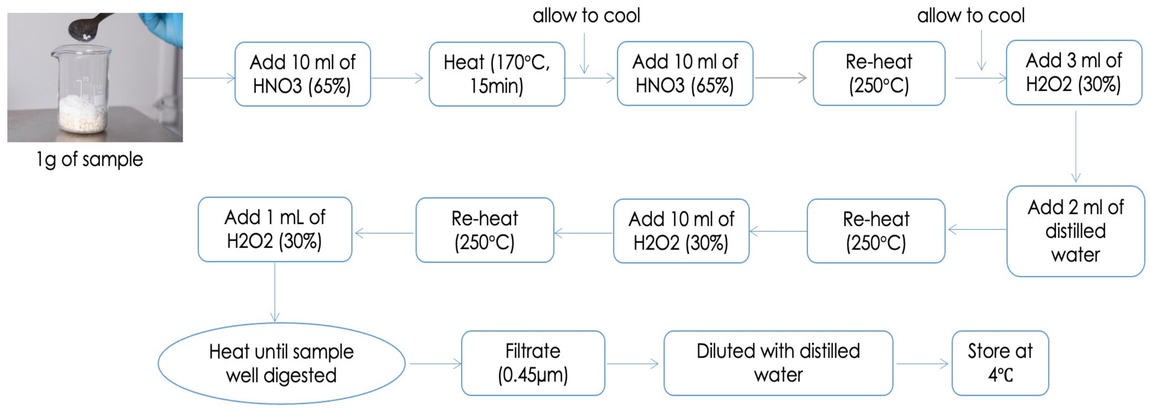

Fig. 1. Sample digestion procedure

• Parameter analysis

RESULT AND DISCUSSION

Table 1. Concentration of As, Mn, and Fe contamination in rice collected from CT system

Sample Code	As (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
D11-CT (1-T0)	0.00485±0.0002	0.53±0.014	34.75±0.35
D11-CT (2-R2)	0.0042±0.0001	0.0475±0.003	42.1±0.14
D11-CT (3-R5)	0.00335±0.0002	0.0475±0.003	31.55±0.07
D11-CT (4-AHS5)	0.00485±0.0002	0.32±0.028	7.95±0.07
D22-CT (1-T0)	0.00475±0.0003	0.0425±0.003	26.25±0.35
D22-CT (2-R2)	0.0041±0.0001	0.14±0.014	18.875±0.17
D22-CT (3-R5)	0.00445±0.0003	0.19±0.014	33.375±0.17
D22-CT (4-AHS5)	0.0042±0.0002	0.078±0.002	17.575±0.10
D23-CT (1-T0)	0.00355±0.0003	0.0715±0.002	35.75±0.35
D23-CT (2-R2)	0.0046±0.0001	0.0575±0.003	49.4±0.56
D23-CT (3-R5)	0.00485±0.0002	0.0415±0.002	45±0.70
D23-CT (4-AHS5)	0.00375±0.0002	0.061±0.001	39.75±0.35

Table 2. Concentration of As, Mn, and Fe contamination in rice collected from GM system

Sample Code	As (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
D11-GM(1-T0)	0.0031± 0.00	0.13±0.02	11.25±0.35
D11-GM(2-R2)	0.00245± 0.00	0.0275±0.003	55.65±0.49
D11-GM(3-R5)	0.00285± 0.00	0.0325±0.002	45.25±0.35
D11-GM(4-AHS5)	0.0019± 0.00	0.2775±0.003	9.5±0.70
D22-GM(1-T0)	0.0032± 0.00	0.038±0.002	137.7±0.28
D22-GM(2-R2)	0.0031± 0.00	0.029±0.001	47.505±0.71
D22-GM(3-R5)	0.00175± 0.00	0.0395±0.00	4.75±0.35
D22-GM(4-AHS5)	0.00325± 0.00	0.0675±0.003	16.625±0.17
D23-GM(1-T0)	0.0027± 0.00	0.0485±0.002	9.35±0.49
D23-GM(2-R2)	0.00325± 0.00	0.055±0.007	81.25±0.35
D23-GM(3-R5)	0.0019± 0.00	0.044±0.005	11.7±0.28
D23-GM(4-AHS5)	0.0011± 0.00	0.0425±0.003	38.75±0.35

- As content in rice collected from CT system is higher than GM.
- Mn concentration in rice collected from CT system is higher than GM system.
- Most samples collected from GM system had higher concentration of Fe, comparing to rice samples harvested from CT system.
- All heavy metal contents in rice samples, however, were below the WHO/FAO maximum levels.

CONCLUSION

The study found that soil tillage techniques can aid in lowering heavy metal levels.

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