Effects of Wood Vinegar and Cow Manure on Growth of Khao Dawk Pradoo Rice in Experimental Field

Wanida Sumranram*, Thawat Suphason and Wittayakon Phliasanthia

Program of Agricultural Technology, Buriram Rajabhat University, Thailand

*Corresponding author's e-mail: Wanida3403@hotmail.com

Abstract:

Effects of wood vinegar and cow manure on growth of Khao Dawk Pradoo (KDP) rice in experimental field. The objective of this study were to compared wood vinegar with manure cow manure on growth of KDP . The experiment was conducted 6 treatments: 1. No manure, cow manure and wood vinegar (control). 2. cow dung fertilizer rate 1,000 kg / rai and wood vinegar dilution rate 1:20. 3. cow dung fertilizer rate 1,000 kg / rai and wood vinegar diluted 1:40. 4. Wood vinegar diluted 1:20. 5. Wood vinegar diluted 1:40 and 6. cow dung fertilizer at 1,000 kg. / Rai. Completely Randomized Design (CRD) with 3 replications were experimented. The result was found that cow dung consists 1,000 kg / rai. make the height of plant, number of tillers, leaf area, leaf area index is highest on statistically significant. Therefore, wood vinegar at the rate 1:20 and 1:40 with no cow dung and cow dung fertilizer have make the number of tiller and the high of plant at 60 day after planting (DAP) are statistical significantly. In conclusion, the cow dung fertilizer at the rate 1000 kg/rai make highest the number of tillers as 10.66 shoot per tiller at significantly.

Keywords: Cow dung, Wood vinegar, Growth, Khao Dawk Pradoo, Native rice

Introduction

The current agricultural production uses a lot of agricultural chemicals and causes chemical residues on the production. Which directly affects the health of consumers. In addition, excessive use of chemical fertilizers causes nitrate contamination in underground water and surface water which is an important environmental problem. Farmers are more concerned about health and the environment; therefore, they want to consume safe food and are willing to pay higher prices than usual organic rice production is one way to meet the specific groups of consumers. However, organic rice production has quality criteria that farmers have to follow. That is not use all types of chemicals in production, including chemical fertilizers and pesticides (Wanida, 2015).

Khao Dawk Pradoo rice :KDP rice is a native of Isan sticky rice, short, red, hard to eat, has high nutritional value, soft, sweet, delicious, and crunchy. It is attractive colors to eat because it is a black color and it is native rice. Farmers do not grow well because they are rice that is not good price, thus causing farmers to grow less or grow just enough to eat in the household. The factors that are important in rice cultivation are fertilizers, which in rice production, fertilizer is an important for produce yield which the main cost of rice production was from organic fertilizers contain nutrients that are essential to the growth of essential elements. In addition, the rate of nutrient release in cow manure occurs slowly because it has to go through the process of decomposition by the activity of microorganisms in the soil. Therefore, may cause plants grown by using cow manure to receive nutrients that may not be able to meet the needs of plants in each period of growth, which chemical fertilizers are fertilizers that contain the main food that is dissolved in the form that plants can use as soon. The high concentration of wood vinegar has a strong disinfectant effect due to the high acidity and contains compounds such as methanol and phenol which can be sterilized or pest repellent the beneficial and anti-bacterial microorganisms will increase more receiving nutrients from wood vinegar can be used in agriculture as well.

Therefore, the researcher team has the objective to study wood vinegar and cow manure on growth, yield, yield components of Khao Dawk Pradoo rice in the field of Nong Khwang experimental plot.

Materials and methods

Soil preparation

Keep the soil in each the plot for analysis soil pH, available phosphorus, total nitrogen, potassium extraction and electrical conductivity before and after rice planting. To dry out the soil in each plot for about 1 week. Prepare the soil in the planting plot with an area of 6 × 2 meters per area, which has 6 treatments of experiment.

Rice planting

Select the healthy seeds and take the seeds 5-10 seeds per hill in the bed plant. Measure the space length to 25 × 25 cm. Then cover the hill to protect animals or insects to bite them. The experimental was divided as 6 treatments as following as:

1; no fertilizer (control)
2; cow dung fertilizer 1,000 kg./rai + wood vinegar 1:20
3; cow dung fertilizer 1,000 kg./rai + wood vinegar 1:40
4; wood vinegar 1:20
5; wood vinegar 1:40
6; cow dung fertilizer 1,000 kg./rai.

Data Analysis

Soil samples were collected before planting the rice and after harvest for soil analysis. Soil property were recorded for pH, electrical conductivity, organic matter by Walkley and Black method (Black, 1965), soil texture (%sand, silt, clay), available P (Bray II extraction (Drilon, 1980), total nitrogen by Kjeldahl (Black, 1965) and extractable K by 1 N Ammonium acetate (NH4OAC) method (Cottenie, 1980). For plants in each plot were randomly selected at tillering and maximum tillering stages, and the data were recorded for plant height and tiller number. At harvest, plants in each plot were harvested and the data were recorded for leaf area and leaf area index by direct methods can be easily applied on collecting leaves during leaf fall in traps of certain area distributed below the canopy. The area of the collected leaves can be measured using a leaf area meter.

Results and discussion

The purpose of this research was to study the effects of cow manure and wood vinegar on growth of Dawk Pradoo rice all 6 treatments in Completely Randomized Design (CRD). The results were analyzed in the following table.

Soil chemical properties before rice planting

From the analysis, it is found that the total nitrogen in soil was very low as 0.0231 %, available phosphorus very high as 55.00 mm / kg., exchangeable potassium was low as 252.67 mm./kg. The soil organic matter was low as 0.411%. The acidity - alkalinity of the soil is slightly acidic, with a pH of 6.36. The soil does not have salinity at 0.028 EC. There is no effect on plant growth. The characteristics of soil series is Ban Phai Series (Bpi) are classified in the soil series 41, which classify sub-soil groups (loamy, siliceous, isohyperthermic Arenic Paleustalfs) with characteristics and soil properties. (Table 1)

Table 1 Chemical soil properties before rice planting

Chemical soil properties

Total nitrogen (%)	0.0231	
Available phosphorus (mg/kg)		55.00
Exchangeable potassium (mg/kg)		252.67
Organic matter (%)		0.411
pH		6.36
Electrical conductivity		0.028

Effects of fertilizer application on the growth of Dawk Pradoo rice.

Height of rice.

No statistical difference all of treatment at 30, 60, 90 and 120 days after planting (Table 2).

Table 2 Plant height of Dawk Pradoo rice in each treatment at 30, 60, 90 and 120 day after planting.

Treatment	Height (cm.)			
	30	60	90	120
No fertilizer (control)	54.33	55.33	76.66	80.00
Cow dung 1,000 kg./rai+wood vinegar 1:20	47.66	58.00	90.33	86.73
Cow dung 1,000 kg./rai+wood vinegar 1:40	53.66	62.33	101.33	85.73
Wood vinegar 1:20	59.66	53.66	79.66	79.23
Wood vinegar 1:40	49.10	63.66	93.00	82.50
Cow dung 1,000 kg./rai	54.66	66.00	90.06	83.16
F-test	ns	ns	ns	ns
CV (%)	2.76	1.65	2.14	4.03

Means in the same column with the same letter are not significantly different by DMRT at 0.05 probability level.

Ns : not significant and significant at 0.05 probability level, respectively

Number of tiller per planting plot

The application of cow dung fertilizer and without the fertilizer and the vinegar at the ratio of 1:20 and 1:40 resulted in the number of tiller per planting plot at 30, 90 and 120 days was no statistical difference. Cow dung fertilizer application at the rate of 1,000 kg / rai and vinegar at the rate of 1:20 and 1:40 resulted in a significant difference in the number of tiller per hill during the 60 DAP. The method of cow dung fertilizer at the ratio 1,000 kg./Rai have the highest number of tiller per hill at 10.66 tiller, followed by non-fertilizer application , cow dung fertilizer 1,000 kg ./Rai + wood vinegar at the rate of 1:40 , Wood vinegar rate 1:20 , cow dung fertilizer 1,000 kg / rai + wood vinegar rate 1:20 T2, wood vinegar rate 1:40 , with number of tiller per hill were 6.00 6.00 6.00 4.66 and 4.33 tiller per hill, respectively.(Table 3)

Table 3 Number of tiller per planting plot of Dawk Pradoo rice in each treatment at 30, 60,90 and 120 day after planting

Treatment	Number of tiller per planting plot (tiller)			
	30	60	90	120
No fertilizer (control)	4.66	6.00b	5.33	5.66
Cow dung 1,000 kg./rai+wood vinegar 1:20	6.33	4.66c	6.33	5.66
Cow dung 1,000 kg./rai+wood vinegar 1:40	6.66	6.00b	6.33	5.66
Wood vinegar 1:20	6.33	6.00b	5.00	4.66
Wood vinegar 1:40	6.00	4.33c	5.33	5.00

Cow dung 1,000 kg./rai	5.33	10.66a	8.33	9.33
F-test	ns	*	ns	ns
CV (%)	3.40	3.03	3.36	2.34

Means in the same column with the same letter are not significantly different by DMRT at 0.05 probability level.

Ns : not significant and significant at 0.05 probability level, respectively

Leaf area and leaf area index

Leaf area and leaf area index of rice after planting by cow dung fertilizer at the rate 1,000 kg./rail and no fertilizer and plus wood vinegar at the rate of 1:20 and 1:40 . No statistical difference with the highest of leaf area was cow dung fertilizer 1,000 kg / rai + wood vinegar at 1:40 with an area of 48.34 square centimeters, followed by cow dung fertilizer 1,000 kg / rai , without fertilizer , cow dung fertilizer 1,000 kg / rai + wood vinegar rate 1:20 , wood vinegar at 1:40 , and wood vinegar at the rate of 1:20 have average leaf area is 39.71 34.84 32.16 31. and 30.56 square centimeters, respectively. (Table 4)

Table 4 Leaf area of Dawk Pradoo rice in each treatment at 30, 60, 90 and 120 day after planting

Treatment	**Leaf area (cm^2)**	**Leaf area index (-)**
No fertilizer (control)	34.84	0.87
Cow dung 1,000 kg./rai+wood vinegar 1:20	32.16	0.79
Cow dung 1,000 kg./rai+wood vinegar 1:40	48.34	1.20
Wood vinegar 1:20	30.56	0.76
Wood vinegar 1:40	31.67	0.79
Cow dung 1,000 kg./rai	39.71	0.98
F-test	ns	ns
CV (%)	2.04	1.20

Means in the same column with the same letter are not significantly different by DMRT at 0.05 probability level.

Ns: not significant and significant at 0.05 probability level, respectively

Conclusions

It was found that the nitrogen content in the soil is very low, available phosphorus and extractable potassium very high. The soil organic matter is low. The acidity - alkalinity of the soil is slightly acidic, with a pH of 6.36. No statistical difference all of treatment at 30, 60, 90 and 120 days after planting. The application of cow dung fertilizer and without the fertilizer and the wood vinegar at the rate of 1:20 and 1:40 resulted in the number of tiller per planting plot at 30, 90 and 120 DAP. was no statistical difference. In addition, the application of cow fertilizer and the vinegar at the rate of 1:20 and 1:40 resulted in the number of tiller per planting plot at 60 DAP was differently statistically significant because of it is high tillering to initial pregnant stage of rice growth stage for absorb fertilizer and wood vinegar for promote the tiller on this growth stage. Leaf area and leaf area index of rice after planting by cow dung fertilizer at the rate 1,000 kg./rail and no fertilizer and plus wood vinegar at the rate of 1:20 and 1:40 were no statistical difference.

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