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Studies on the Improvement of Jaagaru (Calcareous Heavy Clay Soil) in Okinawa Island 2 Effects of Niibi Addition on the Chemical Properties of Jaagaru

メタデータ	言語: English 出版者: 沖縄農業研究会 公開日: 2009-01-29 キーワード (Ja): キーワード (En): 作成者: Oshiro, Kishin, 大城, 喜信 メールアドレス: 所属:
URL	http://hdl.handle.net/20.500.12000/0002015307

Studies on the Improvement of Jaagaru (Calcareous Heavy Clay Soil) in okinawa Island

II Effects of Niibi Addition on the Chemical Properties of Jaagaru

by

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(Okinawa Pref. Agr. Exp. St.)

1 Introduction

In the previous paper it was pointed out that possibility of the improvement of the physical properties of surface soil of Jaagaru by Niibi dressing.

The effects of Niibi dressing on the chemical properties of Jaagaru were investigated before immediate Niibi dressing was carried out. The present paper reports the effects of Niibi addition on the chemical properties of Jaagaru.

2 Materials and Methods

(1) Soil Samples: Surface soils of Inamine and Iju series.

(2) Sampling Sites: Fields of Okinawa Agricultural Experiment Station.

(3) Sampling Site of Niibi: Aza Gusi, Naha City.

(4) Chemical Analysis.

a. Soil pH with Glass Electrode pH Meter.

b. Organic Carbon by Tyulin Method.

c. Total Nitrogen by Kjeldahl Method.

d. Cation Exchange Capacity by using N Ammonium Acetate buffered at pH 7.0.

e. Exchangeable Bases: Calcium and Magnecium by E. D. T. A. Method; Pottasium and Sodium by Flame Spectrophotometer.

f. Available Phosphorous by Truog Method.

3 Results and Discussion

(1) Chemical Properties of Jaagaru Soil Samples.

Table 1 shows some of the chemical properties of Jaagaru soil samples.

Jaagaru soils are alkaline in reaction: Low in total carbon, nitrogen and organic matter contents. High in cation exchange capacity, high in exchangeable bases specifically in calcium. Available phosphorous content of Inamine soil is very high but very low in Iju soil.

(2) Chemical properties of Niibi Sample.

Table 2 shows some of the chemical properties of Niibi sample.

Reaction of Niibi sample is near neutral with pH (H_2O)6.8. Niibi does not contain any organic matter. Available phosphorous content is very low. Cation exchange capacity is 8.50 me. As Niibi consists mainly of fine sand, clay minerals of it can be high in negative charge. Magnecium is the highest among the exchangeable bases, then decreasing in the order of calcium, sodium and potassium. Base saturation of it is 85.6 percent.

(3) Effects of Niibi Addition on the Chemical Properties of Jaagaru Soil Samples.

Changes in the chemical properties of the Jaagaru soil samples mixed with Niibi are given in Table 3.

Table 1. Chemical Properties of Jaagaru Soil Samples

		Soil Samples.	
pH		Iju	Inamine
1:1(H_2O)		8.09	7.30
1:1(KCl)		7.10	6.17
Organic carbon	%	0.57	0.93
Total Nitrogcn	%	—	0.09
C/N		—	10.3
Organic matter	%	0.99	1.61
Available P_2O_5	*mg*/100g	1.95	60.50
CEC	me/100g	21.4	24.2
Exch. bases	me/100g		
Ca		27.1	19.1
Mg		4.5	2.6
K		0.41	0.51
Na		0.45	0.45
Base saturation		100	94.1

Table 2. Chemical Properies of Niibi

pH		
1:1(H_2O)		6.80
1:1(KCl)		4.61
Organic Carbon	%	0.0
Total Nitrogen	%	0.0
Available P_2O_5	*mg*/100g	3.55
CEC	me/100	8.50
Exch. bases	me/100g	
Ca		1.54
Mg		4.90
K		0.10
Na		0.70
Base saturation	%	85.2

Table 3. Chemical Properties of Jaagaru Soils Mixed with Varying Amounts of Niibi

	Jaagaru Soil							
	Iju				Inamine			
Ratio of Niibi added (wt. %)	0	30	50	70	0	30	50	70
PH								
1:1(H_2O)	8.09	—	8.04	7.79	7.30	—	7.11	6.95
1:1(KCl)	7.40	—	7.39	7.10	6.17	—	5.67	5.30
Organic carbon %	0.57	0.33	0.21	—	0.93	0.60	0.39	—
Total nitrogen %	—	—	—	—	0.09	0.06	0.04	—
Organic matter %	0.99	0.56	0.36	—	1.61	1.04	0.67	—
CEC me/100g	21.4	18.9	13.2	—	24.2	20.0	18.4	—
Exch bases me/100g								
Ca	27.1	17.1	14.5	—	19.1	13.8	11.1	—
Mg	4.5	4.5	4.7	—	2.6	3.0	3.7	—
K	0.41	0.32	0.26	—	0.51	0.39	0.31	—
Na	0.45	0.52	0.58	—	0.45	0.52	0.58	—

Soil pH, total carbon and nitrogen contents, CEC, and exchangeable calcium and potassium of the Jaagaru soil samples decrease slightly with increasing ratio of Niibi addition. On the other hand, exchangeable magnecium and sodium increase slightly with increasing ratio of Niibi. The available phosphorous content of Iju soil increases slightly but that of Inamine soil decreases in greater degree with increasing amounts of Niibi addition.

The results obtained are the reflection of the chemical characteristics combined with Niibi and Jaagaru soil samples, indicating no abrupt changes in the chemical properties of Jaagaru with the dressing of a large amount of Niibi which may be practiced in the field.

4 Conclsuions

Effects of Niibi addition on the chemical properties of Jaagaru were investigated.

(1) Jaagaru samples are alkaline in reaction; high in exchangeable bases specifically in calcium; low in organic matter content.

(2) Niibi is neutral in reaction; no organic matter content.

(3) There is an indication of preferable chemical conditions of Jaagaru with increasing the amount of Niibi addition.