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Variations in pattern of decomposition of added organic matter and C: N ratio in different rice soils of Kerala

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Abstract: *Major rice growing tracts in state coming under 4 agro-ecological units (AEU's) were selected namely, Onattukara sandy soil (AEU 3), Kuttanad (AEU 4), midland wetland laterite(AEU 10), and black soil from ChittorTaluk of Palakkad(AEU 23). An incubation experiment was conducted in the laboratory using these 4 soil types namely, Onattukara sandy soils(S1), Kari soils from Kuttanad (S2), midland wetland lateritic soil(Pattambi (S3) and Black soil from ChittorTaluk of Palakkad(S4) to study the pattern of decomposition of added organic matter and to identify the corresponding variations and stabilization of C:N ratio at equilibrium. For this, the above four soils were incubated under submerged condition with (5 t ha^{-1}) and without (0 t ha^{-1}) incorporation of paddy straw as the source of organic matter. Our results demonstrate that the C:N ratio based on total carbon and total nitrogen in Kuttanad soils was not stabilized at 10:1.*

Keywords: *Rice soils. Paddy straw .C:N ratio.submergedcondition.*

I. Introduction

Major rice growing tracts in state coming under 4 agro-ecological units (AEU's) were selected namely, Onattukara sandy soil (AEU 3), Kuttanad (AEU 4), midland wetland laterite (AEU 10), and black soil from ChittorTaluk of Palakkad (AEU 23).These soils are with widely varying fertility status. The sandy plains of Onattukara are very poor in fertility due to low organic matter content and sandy texture. Kuttanadsoils are potentially acid sulphate soils with high acidity and high organic matter content. The midland lateritic soils are the most dominant soil type in the state with high acidity, low organic matter content and hence with low productivity. Soils from Palakkad eastern plains are neutral black cotton soils with high productivity. These soils underflooded anaerobic environment behave differently with respect to dynamics and transformation of nutrient elements.

Soil test based fertilizer recommendation for rice at present is based on analysis of soil samples after drying and processing. However,the chemistry and dynamics of nutrient transformations under anaerobic soil environment is quite different from that of aerobic soils as detailed byPonnamperuma (Ponnamperuma, 1972). Thus, analysis after drying definitely changes the levels of plant available forms due to oxidation and subsequent transformations. Hence, the analytical results may not reflect the actual status of plant available pools of nutrient in flooded environment. Thus, to get a real picture of nutrient availability in flooded anaerobic environment samples are to be taken as such without disturbing the reduced anaerobic environment and to be analyzed.

The above background information necessitated the present study with the following objective:

- To study the C:N ratio equilibrium under anaerobic soil environment so as to develop ratings for nitrogen fertility based on organic carbon content under submerged soil.

II. Materials and Methods

The present investigation was carried out at Radiotracer laboratory, College of Horticulture, Kerala Agricultural University,Thrissur during 2012-2014. In order to achieve the objectives, major rice growing tracts in state coming under 4 agro-ecological units (AEU's) were selected namely, Onattukara sandy soil (AEU 3), Kuttanad (AEU 4), midland wetland laterite (AEU 10), and black soil from ChittorTaluk of Palakkad (AEU 23).The details of locations and soil samples collected are furnished in table 1.

Table 1. Locations of soil sampling, soil taxonomy and agro-ecological units

Soil sample No	Soil type	Location	Soil taxonomy	Agroecological unit
1	Onattukara	Eerezhuthekku Chettikulangara N 09°13.297' E 076°31.504'	Entisol	Onattukara sandy plain (AEU 3)
2	Kuttanad	Poovathikkari,Vechoor, Vaikom	Entisol	Kuttanad (AEU 4)

		N 09°41.026' E 076°26.666'		
3	Midland laterite (wetland(2)	Bankalamppadam, Ongalloor N10°47.602' E076°12.988'	Ultisol	North central Laterite (AEU 10)
4	Black cotton (1)	Nalleppilly N 10°42.901' E 076°47.398'	Vertisol	Palakkad eastern plains (AEU 23)

2.1 Incubation experiment

Four soil types namely, Onattukara sandy soils (S1), Kari soils from Kuttanad (S2), midland wetland lateritic soil (Pattambi (S3) and Black soil from ChittorTaluk of Palakkad (S4) to study the pattern of decomposition of added organic matter and to identify the corresponding variations and stabilization of C:N ratio at equilibrium.For this, the above four soils were incubated under submerged conditions with and without incorporation of paddy straw as the source of organic matter. Water level was maintained at 5 cm above the surface of soil in all pots. The experimental details are given below:

Treatments:

(a) Soil types: 4
(5 kg soil per pot)
(1) Onattukara sandy soils (S1)
(2) Kari soils from Kuttanad (S2)
(3) Midland wetland lateritic soil (Pattambi (S3)
(4) Black soil from ChittorTaluk of Palakkad (S4)
(b) Levels of organic matter:2
(Source of organic matter: Paddy straw)
(1) 0 t ha^{-1}(O1)
(2) 5 t ha^{-1}(O2)
Treatment combinations: 4X2=8
Replications: 3
Design: CRD
The total carbon and total nitrogen were estimated at fortnightly interval till the C:N ratio was stabilized.

Plate 1. Treatment combinations of incubation study

Treatment details

Treatments	Soil type
T1	Onattukara sandy soils (With OM)
T2	Onattukara sandy soils (Without OM)
T3	Kuttanad soil (With OM)
T4	Kuttanad soil (Without OM)
T5	Midland wetland laterite (With OM)
T6	Midland wetland laterite (Without OM)
T7	Palakkad eastern plains (With OM)
T8	Palakkad eastern plains (With OM)

2.2Methods of soil analysis

Total C and N were estimated by CHNS analyzer(Model: Elementar'svario EL cube)

III. Results

Figure 2. Changes in C:N ratio in Onattukara soil with respect to days of submergence

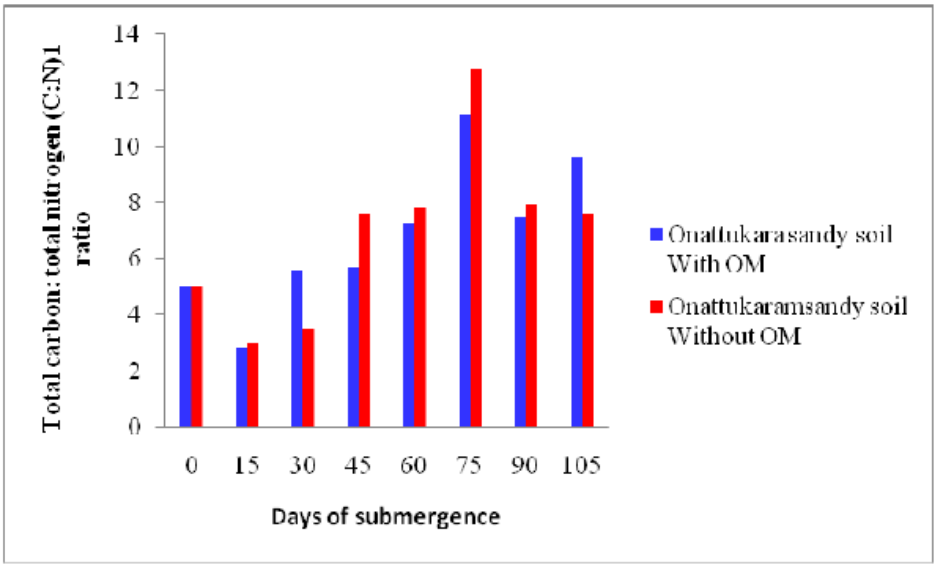


Figure 3. Changes in C:N ratio in Kuttanad soil with respect to days of submergence

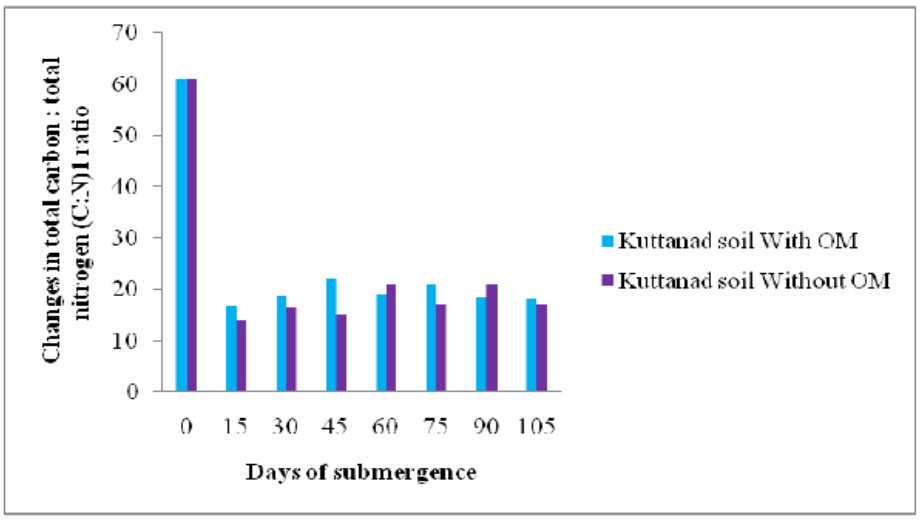


Figure 4. Changes in C:N ratio in lateritic soil with respect to days of submergence

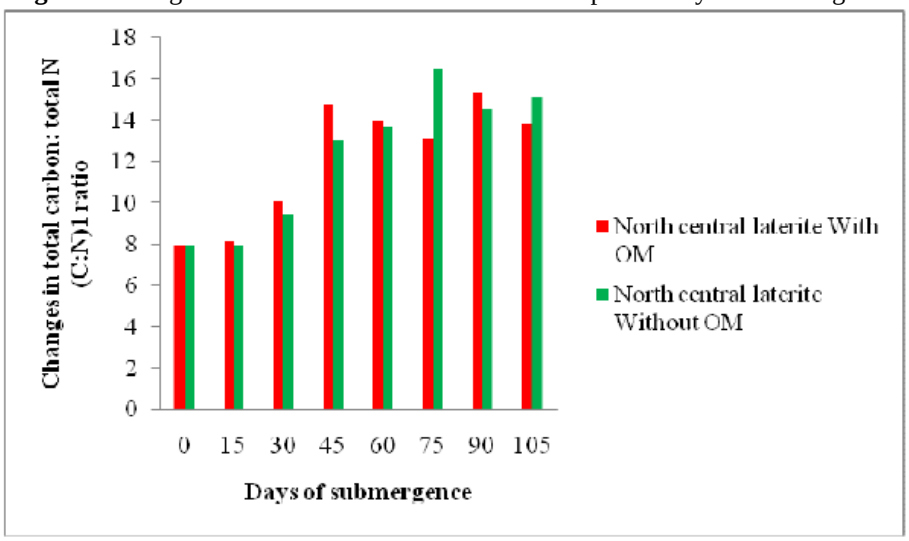
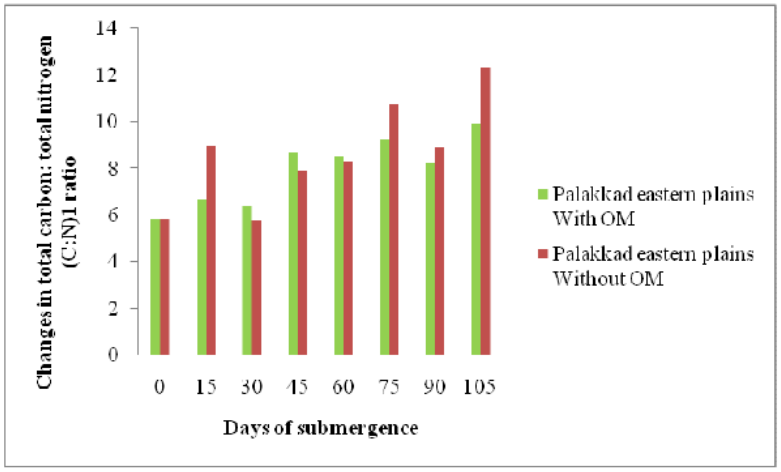


Figure 5. Changes in C:N ratio in Palakkad eastern plains with respect to days of submergence



The C: N ratio was found to stabilize at 7 to 9 after 3 months of incubation in Onattukara soil with the addition of organic matter whereas it stabilized at 7 in the treatment without the addition of organic matter.The (C: N) 1 ratio observed in Kuttanad soils with andwithout the addition of organic matter was 18.32 and 17.26 respectively, whereas it stabilized in and around 10 in Chittor black soils. Addition of organic matter slightly increased the ratio in Onattukara and Kuttanad soils whereas such a difference was
not noticed in lateritic and Chittor soils.

IV. Discussion

It is clear from the data that the C :N ratio increased and stabilized in all the soils except in Kuttanad where a gradual decrease was noticed. This is due to the slow decomposition of organic matter in the acid sulphate soils of Kuttanad.

V. Conclusion

It is clear that under anaerobic flooded conditions the rate of decomposition of organic matter is slower than under oxidized aerobic environment resulting in wider C:N ratio at equilibrium. The study envisaged the importance of C:Nrelations in the soils under anaerobic flooded conditions to know the equilibrium C:N ratio and the time taken for equilibration.This in turn will definitely help to have a meaningful organic carbon based nitrogen recommendations which ultimately modify the present recommendation.

References

[1]. Ponnamperuma F. N. 1972. The chemistry of submerged soils. *AdvAgron*. 24:29-96.
[2]. Lal, R. 2004. Soil carbon sequestration in India.*Clim.change.* 65**:** 277–296.