

Variation on the Physical Parameters of Rice Husk Depending on the Texture of Quality of Different Types of Soil on Odisha

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Abstract: Rice husk generated during rice cultivation is generally used as an alternative source for fuel. Rice husk provides a vital natural source for silica. It mostly constitutes SiO_2 as the major product along with oxides such as Al_2O_3 , Fe_2O_3 , CaO , MgO etc. As the major constituent, the predominance of silica primarily depends on the types of soil on which the grain is generated. The availability of various mineral and metal oxides in the soil sources are responsible for constituting the rice husk. In the present study an attempt has been made to collect rice husk released from the rice grain cultivated in different types of soil. The study includes the analysis and comparison of various physical composition and mineralogical texture changes for different rice husk samples generated from various soils. Also trial has been made to optimize and identify a particular type of rice husk that can be utilized adequately for the generation of metallurgical grade silica.

Key words: Rice husk, red soil, laterite soil, silicon oxide, optimization.

Introduction

Rice husk is the outer covering of rice grain which is removed and dumped as a waste material. It is estimated that in India the annual rice production is 12 million tonnes (Adams, 1966; Ayers and Westcott, 1985). Rice husk is characterized by low bulk density and high ash content.

The climate variation and geographical changes are the vital aspects (Bennett, 1988; Bernstein, 1975; Bohn et al., 1979) of a state like Odisha. Here, soils are highly fertile producing oilseed, sugarcane, coconut and turmeric and one tenth of the rice production of India is associated with Odisha. In Odisha soil is generally developed by the parental material and climatic condition (Curtin et al., 1995). The details of the natural

vegetation follows the climatic parameters which helps in generation of four different types of soil (1) Mixed red and yellow soil, (2) Black soil, (3) Laterite soil and (4) Coastal saline and alluvial soil.

Mixed Red and Yellow Soil

Mixed red and yellow soil occupy 5.5 m ha of land. These soils occur in the districts of Sambalpur, Bargarh, Deogarh and Sundargarh. It differs in depth, texture and colour. The soil when considered mineralogically is shallow in depth and coarse-textured. These are more acidic and contains nitrogen and phosphorous. This soil

Table 1: Chemical composition of rice husk

Material	Fe_2O_3	SiO_2	Al_2O_3	CaO	MgO	LOI
Raw rice husk	1.0	65.8	5.12	2.36	2.08	23.64

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Table 2: Chemical composition of different types of soil of Odisha

<i>Types of soil</i>	<i>Fe₂O₃</i>	<i>SiO₂</i>	<i>Al₂O₃</i>	<i>Cr₂O₃</i>	<i>CaO</i>	<i>MgO</i>	<i>MnO</i>	<i>LOI</i>
Mixed red and yellow soil	42.5	10.2	30.0	4.3	6.8	4.32	9.2	2.3
Black soil	32.8	22.01	21.06	1.2	12.8	8.39	5.8	2.0
Laterite soil	36.6	20.1	13.2	6.01	6.8	5.6	0.06	1.0
Coastal saline and alluvial soil	26.6	31.6	26.8	0.83	10.8	12.4	2.1	1.9

has efficiency to grow crops like rice, sugarcane, potato, brinjal, tomato etc.

Black Soil

These soils occupy 0.96 m ha of land in the agricultural context in Odisha. These are available in the districts of Puri, Ganjam, Malkangiri, Kalahandi, Nuapada, Bolangir, Sonepur, Boudh, Sambalpur, Bargarh and Anugul. The soil appears black due to presence of titaniferous magnetite, humus, bituminous etc. These soils are formed due to weathering of basic rock in the low lying area in which more than 30% clay content is there (Curtin et al., 1993). pH of the soil is neutral with calcium content high whereas phosphorous, potassium, zinc and boron content are very low. Moisture of the soil is early stress under drought. Soil cannot be ploughed either at low or high moisture conditions. Application of bulky organic compounds enhances the water infiltration rates (Frankenberger et al., 1996). The soil is suitable for growing rice, jowar, bajra, maize, safflower, mustard and cotton.

Laterite Soil

Laterite soil occupies 0.70 m ha of land in the crust of Odisha. These soils are found in the districts of Puri, Khurda, Nayagarh, Cuttack, Dhenkanal, Keonjhar, Mayurbhanja and Sambalpur. These are characterized by compact vesicular structure and rich in hydrated oxides of iron and aluminium. These soils are slightly acidic with pH 4.5 to 5.8. Due to unavailability of Fe₂O₃ and Al₂O₃, huge nitrogen loss takes place (Freeze and Cherry, 1979). These soils suffer from iron toxicity due to literal movement of soluble iron. Organic manure can be applied to grow green crops in these soils. Seed treatment with molybdenum improves the yield of rice,

finger millet and minor millets with proper application of fertilizers.

Coastal Saline

These soils are helpful for cultivating mustard, barley, linseed, chilly, sugar beet, tomato, spinach etc. The coastal saline content is exchangeable (Helmke and Sparks 1996). In the soil, the sodium in acidic medium could be reclaimed by the exchange of Na⁺ or H⁺ by Ca⁺⁺. These soil can be improved by use of organic manures, recycling of straw and incorporating green manure crops which reduce the salinity and alkalinity of the soil.

Material and Methods

In order to carry out the study, rice grain is being cultivated in four different pots (in duplicate)

Pot 1 contains Mixed red and yellow soil.

Pot 2 contains black soil.

Pot 3 contains laterite soil.

Pot 4 contains coastal saline and alluvial soil.

Each pot is containing 5 kg of soil. In order to make the rice grain fertile, it was soaked in luke warm water for 24 hours and then seeding was carried out. The offspring of rice grain were obtained after seven days and the plant was subjected to grow. The rice grain obtained from the plants were dried and rice husk separated from various sources.

Analysis of Rice Husk Fortified Soil

The rice grain cultivation has been tried on those four types of soil and the rice husk thus obtained is analyzed

Table 3: Different rice husks obtained from different soils

<i>Types of soil</i>	<i>Fe₂O₃</i>	<i>SiO₂</i>	<i>CaO</i>	<i>MgO</i>	<i>Al₂O₃</i>	<i>Cr₂O₃</i>	<i>MnO</i>	<i>LOI</i>
Mixed red and yellow soil	25.02	50.03	2.4	3.8	11.8	4.2	1.3	1.2
Black soil	18.14	63.8	1.1	2.39	9.7	0.8	1.09	2.09
Laterite soil	6.2	83.04	0.8	1.6	6.3	0.6	0.46	1.4
Coastal saline and sandy soil	2.1	94.12	0.5	1.0	1.1	0.2	0.91	1.9

through chemical treatment. The result obtained is represented in Table 3.

Conclusion

The result showed the chemical analysis of the rice husk obtained from different soils of Odisha. The data revealed that the rice husk obtained from coastline and sandy soil shows the maximum SiO_2 content followed by laterite soil, whereas the black soil and red and yellow soil show comparatively less silica content. Similarly the aluminium content of various soil samples vary adequately depending on the concentration and availability of the minerals and metals. This result revealed that rice cultivation has a parallel influencing parameter of the silica content of the soil.

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