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Assessment on quality parameters (protein, carbohydrate, hulling, milling and HRR) of traditional short grain aromatic rice, high yielding scented rice and fortified rice under organic farming

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Abstract
The field experiment was conducted in the field during *kharif* 2021 at the Indira Gandhi Krishi Vishwavidyalaya Research cum instructional farm in Raipur (C.G.). The experiment was laid out in Randomized Block Design with three replications. The treatment composed of fifteen rice variety whereas eight traditional short grain aromatic rice. Each traditional short grain variety was given recommended dose @ 60:40:30 N:P:K kg ha^{-1} through FYM, Vermicompost, Neem cake (1/3 part each) and Vermiwash10% at 30 and 50 DAT. Each high yielding scented rice and fortified rice variety was given given recommended dose @ 80:50:40 N:P:K kg ha^{-1} through FYM, Vermicompost, Neem cake (1/3 part each) and Vermiwash 10% at 30 and 50 DAT. The remaining Phosphorous was given from Rock phosphate. The cultivar Protezin had the highest protein and Amrit bhog found highest carbohydrate content among all the selected varieties.

Keywords: Quality, aromatic rice, scented rice, fortified rice, organic, farming

Introduction
Rice (*Oryza sativa* L.) is one of the most cereal crops which is used as a main source of food for more than 85% population in the world and 90% in Asia but shortage, imbalanced, inappropriate or enormous use of nutrients in agricultural systems is a vital cause for low crop yields in parts of developing country. Out of 782 million tonnes of global rice production from 167.1 million hectares, India produced 116.42 m t in 44.5 m ha (rainy season: 102.13 m t from 39.27 m ha).

Chemical fertilizers, pesticides, and fungicides are widely utilized in agriculture to improve crop yields. Most of the compounds used are synthetic, and their over use effects environmental pollution and human health difficulties. Presently, several countries are working to decreases the use of agrochemicals. Organic agriculture is now emerging as a sustainable alternative to traditional agriculture using environmentally friendly strategies such as the application of organic fertilizers from plant and animal waste and pesticides based on plant extracts and microbials. But, the availability of commercial biopesticides and organic fertilizers is very limited because there are definite barriers to the commercialization of biological products.

The scented rice cultivars are called for its unique aroma, superfine kernel, good cooking qualities and excellent palatability. It is very popular because its inherent scent and its demand has recently enhanced. But these varieties are often grown by the farmers for commercial purpose mainly because very low productivity. Scented rice has a special place in the world rice market and is normally the maximum priced rice. Aromatic rice has great potential to attract rice consumer for its taste and deliciousness, and high price to boost up the economic condition of the rice grower in the country. Due to its natural chemical compounds which give it a peculiar scent or aroma when cooked, aromatic rice commands a maximum price than non-aromatic rice.

Introduction of high yielding improved semi dwarf varieties and their wide acceptability may be another cause for shrinking the area and preference over tall indigenous low productivity varieties. Therefore, there is a need for taking research experiments to revive the lost fragrance and taste of these varieties, to enhance their productivity without losing their quality by using organic manure practices alone or in combination.

Sustainable agricultural productivity and improvement in soil health and soil physical properties can be achieved by the use of organic manures and biofertilizer etc. Using organic resources like, cow dung manure, compost crop leftover, vermicompost, blue green algae, phosphorus solubilizing bacteria, rock phosphate and Azospirillum etc deserves priority for sustained production and better resource utilization in organic nutrient management.

Material and Methods

A field experimental was conducted during *kharif* season 2021 at the Research cum Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The soil of experimental field was clayey loam in texture having soil organic carbon (0.42%), low available N (204.6 kg ha^{-1}), medium available P (15.9 kg ha^{-1}), K (340.1 kg ha^{-1}), available Fe (14.23 mg kg^{-1}), available Mn (10.52 mg kg^{-1}), available Cu (1.73 mg kg^{-1}) and available Zn (1.63 mg kg^{-1}) with neutral pH 7.9 (1:2.5 soil: water ratio) and EC (0.31 dSm^{-1}). Soil samples for various soil physico-chemical i.e., pH, electrical conductivity, organic carbon, available nitrogen, available phosphorous, available potassium, available micronutrients were analyzed after harvest of crop.

Protein content in grain

The protein content (%) of rice grain from each treatment was calculated by using the following formula (A.O.A.C., 1965)
Crude Protein %= N content (%) × 6.25 (as a constant factor).

Carbohydrate content in grain

The carbohydrate content (%) of rice grain from each treatment was calculated by using the following formula (done by Anthrone reagent)

Amount of carbohydrate present in 100mg of the sample = (Mg of glucose ÷ Volume of test sample) × 100

Hulling percentage

100 g of well threshed and cleaned grains are dehusked with the help of Satake Laboratory Sheller and the dehusked or brown rice is weighed again.

$$\text{Hulling \%} = \frac{\text{weight of dehusked kernel}}{\text{100 grams of paddy}} \times 100$$

Milling percentage

Brown dehusked rice was subjected to standard miller for polishing of the grains and then the weight of milled or polished rice was taken and milling % was calculated.

$$\text{Milling \%} = \frac{\text{weight of polished kernel}}{\text{100 grams of paddy}} \times 100$$

Head Rice Recovery percentage

Milled rice then passed through rice graded depending on its size with tunnels of different mm grooves so as to separate the whole grains from the broken ones. Whole grains and 3/4th grains in size with embryo intact considered for HRR and weighed.

$$\text{Head Rice Recovery \%} = \frac{\text{weight of whole polished grain}}{\text{100 grams of paddy}} \times 100$$

Results and Discussion

Hulling

In Table 1 data on the proportion of different rice variety that were hulled while being produced organically are shown.
Among all the different rice varieties under organic farming recorded percentage is ranged between 71.3 to 79.7%. The greatest varieties are ranged under 76 to 78% for Lokti Machhi, Samund Chini, Lohandi, Aatma Sheetal, Tarun Bhog, Indira Sugandhit Dhan 1, CG Devbhog, Sugandhmati and CG Madhuraj 55. The variety Zinco rice MS (71.3%) had the least percentage value, which is more significant in all the varieties.

Milling

Among all the different rice varieties under organic farming is value for milling percentage is registered in the ranged from 54.15 to 68.9%. The maximum value for milling percentage is recorded in the cultivars Tulsi Manjiri (68.9%) which is highly significant rest over the varieties. The variety Zinco rice MS (54.1%), which are more significant than all the variety, have the least milling % value.

Head Rice Recovery

Head rice recovery is one of the most important factors which affect the quality and marketability of a particular rice variety. Typically, head contains fractured kernels that make 75-80% of the entire kernel.
Among all the different rice varieties under organic farming is observed HRR % is ranged between 42.3 to 62.0 %. The highest value (62.08%) recorded in the varieties Samund Chini which is differ significantly in all tested varieties. The least value for HRR observed in the variety Zinco rice MS (42.3%) which is higher significant in all tested rice varieties.

Table 1: Effect of organic farming on hulling, milling and HRR under different rice variety

Treat.	Variety	Hulling %	Milling %	HRR%
Traditional short grain aromatic rice varieties				
V1	Chinni Kapoor	73.92	59.68	49.23
V2	Lokti Machhi	76.87	64.43	59.42
V3	Tulsi Manjiri	78.75	68.85	56.50
V4	Amrit Bhog	79.70	67.16	53.56
V5	Samund Chini	77.24	67.06	62.08
V6	Lohandi	77.08	60.38	44.30
V7	Aatma Sheetal	77.43	67.60	55.56
V8	Tarun Bhog	77.07	66.30	49.67
High yielding scented rice varieties				
V9	Chhattisgarh Sugandhitbhog	78.40	67.34	57.66
V10	Indira Sugandhitdhan 1	77.25	65.43	53.14
V11	CG Devbhog	76.39	66.37	57.24
V12	Sugandhmati	77.63	65.79	53.50
Fortified rice varieties				
V13	Zinco rice MS	71.33	54.14	42.28
V14	Protezin	74.24	57.92	45.69
V15	CG Madhuraj 55	77.14	65.79	60.31
	S.Em±	0.70	1.04	1.99
	CD (at 5% level)	2.02	3.01	5.78

Protein content

The protein content in rice grain was affected significantly due to individual effect of organic liquid formulations and organic manures and all the different qualitative rice varieties matures by apply in approved organic nutrients is shown in Table 2

Between all the different quality rice varieties under organic farming, maximum protein content recorded in the cultivars Protezin (9.70%) which varies remarkably in rest over the varieties which were different significantly in all the quality rice variety rice under organic farming.

Carbohydrate content

Among all the various rice varieties under organic farming highest value of carbohydrate noted in the cultivars Amrit Bhog (80.27%) and the least value of harvest index noted in Lokti Machhi (66.20%) which varies remarkably in rest over the cultivar.

Table 2: Effect of organic farming on protein and carbohydrate content of different rice variety

Treat.	Variety	Protein content (%)	Carbohydrate content (%)
Traditional short grain rice varieties			
V1	ChinniKapoor	8.87	71.32
V2	Lokti Machhi	8.63	73.93
V3	Tulsi Manjiri	9.19	78.12
V4	Amrit Bhog	9.19	80.27
V5	Samund Chini	9.00	79.69
V6	Lohandi	8.70	78.86
V7	Aatma Sheetal	9.51	72.83
V8	Tarun Bhog	9.07	77.98
High yielding rice varieties			
V9	Chhattisgarh Sugandhitbhog	8.84	71.10
V10	Indira Sugandhit Dhan 1	9.00	72.10
V11	CG Devbhog	9.26	70.09
V12	Sugandhmati	9.05	73.29
Fortified rice varieties			
V13	Zinco rice MS	8.45	78.64
V14	Protezin	9.70	80.13
V15	CG Madhuraj 55	9.07	77.89
	S.Em±	0.28	6.52
	CD (at5%level)	0.83	18.88

Conclusion

The cultivar Protezin had the highest protein content and Amrit Bhog found highest carbohydrate content among all selected varieties.

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