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Morphological approach for characterization of Indian Rice Cultivars

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ABSTRACT

Rice (*Oryza sativa*) is one of the most important crop of the world and it is the principle food of the world's population. It is indigenous crop in India. In this research we have taken seed of various cultivars of rice from Rajendra Agriculture University, Pusa and G. B. Pant University of Agriculture and Technology, Pant Nagar. For shake of convenience, the cultivars have catalogued and each cultivar was assigned a numerical symbol from 1 to 62. Here work mainly based on morphology of cultivars especially Growth habit and plant height to distinguished them.

1. Introduction

Rice (*Oryza sativa)* is one of the most important crop of the world. On the basis of the several findings rice is believed to have been domesticated first in Northern India, Northern Bangladesh, Burma, Thailand, Vietnam and Southern China and later spread to Korea and Japan (300 BC) from China. Rice is now cultivated in almost all Asian Countries. Over 85% of the world's rice production comes from China, India, Bangladesh, Japan, Pakistan and adjoining Islands in the Pacific. Rice grain is highly nutritive and it is rich in starch but has a low content of Protein (7-8%). It also contains fat, minerals and vitamins.

Rice is an annual herbs. The whole root system can be divided into two parts, the seminal or primary roots and the adventitious or secondary roots. The adventitious roots arise from the lower nodes of the plant and its tillers. They are fibrous and branched. The stem is erect, cylindrical, herbaceous with distinct nodes and internodes. The nodes are contracted and solid. The numbers of internodes vary from 10 to 20, branching by tillers. The internodes are fully or partially covered by leaf sheath. The tillers develop from the lower nodes of the stem. The leaves always emerge from the nodes, so the number of leaves on an axis is equal to the number of nodes. A normal leaf possesses the leaf sheath, ligule, auricle and leaf blade(lamina). The ligule is well developed, membranous, colourless or pink coloured. The auricles are well developed, sickle shaped, present at the junction of the sheath and the blade. The leaf blade is long, narrow, lanceolate, acuminate, usually pubscent, parallel venation with a distinct mid rib. The uppermost leaf, the flag is always shorter and broader than the lower leaves.

The inflorescence is a terminal panicle. The main axis or rachis of inflorescence is either erect or curved. One to many branches arises from each node of the rachis. On the end of each branch the spikelets are borne. The spikelets are borne either singly or in clusters of 2 to 7. The number of spikelets on a panicle varies from 50 to 500. Each spikelet is short pedicelled, generally single flowered. The apex of the pedicel is enlarged and is termed as facet. On the facet two glumes occur, one outer and the other inner. The glumes are small, lanceolate and approximately equal in size. These glooms are followed by two more glums (flowering glums), which enclose small flowers or florets arising from a short stem axis or rachilla. Out of the two glums, the large and conspicuous is called lemma. Its apex is pointed and usually prolonged into an awn. The other glume called palea, is situated just opposite the lemma. It is also boat shaped.

The perianth is reduced and is represented by two broad, thick and fleshy lodicules. Stamens are six in number arranged in two regular whorls. The filaments are long, slender and free. The anthers are dithecous. The ovary is superior and unilocular with a single anatropous ovule. Placentation is basal. There are two long styles with feathery stigmas.

The fruit or grain is a single seeded caryopsis. The mature grain is enclosed in the lemma and palea. The grains may be firmly placed or more or less loose inside the golden or brown husk. Grains with husk are referred to as paddy and when husk is removed, they are known as rice. The method used for identifying cultivars of rice are based conventionally on the phenotypic expressions of plant or plant parts. Such expressions are strongly influenced by the environment in which the plant is grown and thus these conventional means have no more impact for characterization of cultivars.

2. Materials and Method

Seed of various cultivars of rice were obtained from Rajendra Agriculture University, Pusa and G.B. Pant University of Agriculture and Technology, Pantnagar. For sake of convenience, the cultivars have catalogued and each cultivar was assigned a numerical symbol from 1 to 62 as follows:-

Symbol	Cultivar	Symbol	Cultivar
1	VL-82	32	IR-262
2	Pant Sugandha-2	33	Shakuntala
3	Pant Basmati	34	Taraori
4	PR-113	35	IR-36
5	VL-62	36	Rajendra Shweta

6	VL-207	37	Rajendra Basmati
7	CR-94	38	RAV-649
8	MTU-7029	39	Radha
9	TYPE-3	40	Sujata
10	Pant Sugandha-15	41	Rajendra Kasturi
11	Sarju-52	42	Bhikkachak
12	Pant Sugandha-3	43	Vaidehi
13	Pant-12	44	IR-20
14	Pusa-1121	45	IR-20
15	Pant-4	46	Rajendra-202
16	Jaya	47	Mahsuri
17	Basmati-370	48	IR-244
18	PR-116	49	Kala Basmati
19	Pant-6	50	Jaishree
20	VL-221	51	TKM-6
21	VL-206	52	Pusa2-21
22	Narendra-359	53	Krishna
23	PRH-10	54	Rajendra-201
24	Pusa-44	55	Kanak
25	Pant-10	56	N-22
26	Co-29	57	Saket-4
27	T-141	58	IET-355
28	Sugandha	59	Govind
29	Gautam	60	VL-61
30	IR-64	61	IR-8
31	Sahal-2	62	Vivek-62

The field was prepared by ploughing and flooded with water. The seeds are sown in the first week of June in flooded condition in rows. The distance between two line was kept 20 cm and from seed to seed 4-5 cm. The seedlings were then planted in seedbeds in another field.

The seedlings were sown at distance of 10 cm and the distance between two such lines was kept 20 cm. 2- 3 seedlings were sown together. The water supply to the seedlings was controlled after transplanting. Water is drained at tillering stage. Ten plants of each cultivar were selected for morphological studies. When they attained their full growth, following, morphological characters of each cultivar were studied:-

A.Growth habit.

B.Plant height.

3. Observation

The morphological characters were observed and recorded in Table-1. It was determined observing the morphology of atleast three replicates of each cultivars. The morphological description of each cultivar is as follows:-

Cultivar

1. The plants were erect herb, attaining a height of 128.3 cm.
2. The erect and herb plants were 110.6 cm high.
3. The growth habit in this cultivar was also erect herb. The plants attained an average height of 106.4 cm.
4. Growth habit was erect herb. The plants attained a height of 120.0 cm.
5. Erect herb plants were 134.6 cm. high.
6. Plants attained a height of 120.2 cm.and erect herb.
7. Erect herb plants were 132.6cm in height.
8. The growth habit was erect herb. Plants attained a height 136.1 cm.
9. The plants were erect herb, attaining a height of 106.1cm
10. Erect and herb plants were 110.3 cm high.
11. The erect herb plants attained an average height of 120.4 cm.
12. The plant growth habit was erect herb. The average height of the plant was 106.4 cm.
13. The plants attained an average height of 108.3 cm and erect herbs.
14. The plants were erect herb, attained a height of 122.2 cm.
15. The plants were erect herb, attaining an average height of 116.0 cm
16. The erect herb plants attained a height of 122.3 cm.
17. Erect herb plants attained an average height of 130.2 cm.
18. Erect herb plants were 138.0 cm. high.
19. Plants attained height of 112.1 cm.and erect herb.

20. The average height of the plant was 136.0cm.and erect herb.
21. The erect herb plants were 140.3 cm high.
22. Erect herb plants were 114.6cm in height.
23. 108.2mm high plants were erect herb in habit.
24. Erect herb plants were 112.5cm in height.
25. The plants were erect herb with an average height of 112.4 cm.
26. The average height of plants was 139.4 cm. and erect herbs in nature.
27. The growth habit was erect herb. Plants attained a height of 141.2cm.
28. The erect herb plants attained a height of 110.6cm.
29. The average height of the plant was 100.6 cm..
30. The plants exhibited an average height of 98.7 cm.
31. The erect herb plants were 107.5 cm in height..
32. The plants were erect herb attaining average height of 104.4cm.
33. 105.3cm high plants were erect herb in habit attaining.
34. Erect herb plants were 103.4 cm high.
35. The plants were erect herbs with average height of 140.7 cm.
36. Erect herb plants attained 102.4 cm height.
37. The average length of the plants was 105.3 cm.
38. Erect herb plants were 105.6 cm high.
39. The plants were erect herbs with a height of 112.3cm.
40. The growth habit was erect herb. The plants attained a height of 105.3 cm..
41. The plants exhibited erect herb habit. They attained an average height of 107.4 cm.
42. Erect herb plants attained a height of 104.2 cm.
43. The erect herb plants were 141.3 cm in height.
44. The plants were erect herbs attaining a height of 106.5 cm.
45. The plants were 100.0 cm in height exhibiting erect herb habit.
46. The erect herb plants attained height of 110.1cm.
47. The average length of the plants was 102.4 cm.
48. The erect herbaceous plants attained a height of 102.6 cm..
49. The plants were 112.3cm high and exhibited erect herbaceous habit.
50. 120.4 cm.high plants exhibit erect herb habit.
51. The average length of plant was 146.6 cm.
52. The erect herbaceous plants were 108.0cm. in height.
53. 111.3 cm long plants exhibited erect herbaceous habit.
54. The erect herbaceous plants attained height of 104.3 cm.
55. The average length of the plants was 114.5 cm. They exhibited erect herbaceous habit.
56. The herbaceous plants were erect and 144.3 cm high.
57. The herbaceous plants measured 104.7 cm in height .
58. The average height of these erect herbs reached 104.3cm.
59. The erect herbs attained and average height of 126.4 cm.
60. The plants were erect herbs attaining a height 132.1 cm.
61. 102.4 cm long, there plants exhibited erect herbaceous habit.
62. This cultivar also exhibited erect herbaceous habit. The plants attained a height of 131.2 cm.

4. Discussion and Results

The data obtained in Table-1 in the present investigation indicated that morphological characters like growth habit and plant height could not distinguish the cultivar of Indian rice sharply. Although variations in traits could be observed among the cultivars, thus they were not sufficient enough to distinguished them from one another.

All the cultivars studied exhibited similar growth habit (erect herb). The average height of the plant showed variation. The tallest of the cultivar was found to be cultivar 51 (146.6 cm.), whereas the smallest was cultivar 30 (98.7 cm.). Based on plant height cultivars were divided into two groups:-

i. Dwarf on Medium tall Cultivars:- In these cultivars plant height ranged between 98.7 cm. to 120 cm. Number of such cultivars were 40. Cultivars belonging to this groups were- 2, 3, 4 , 9, 10, 12, 13, 15, 19, 22, 23, 24, 25, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 52, 53, 54, 55, 57, 58 and 61.

ii. Tall cultivars:- In these cultivars, plant height ranged between 120cm. to 146.6 cm. Such cultivars were 22 in numbers. Cultivars of this group were- 1, 5, 6, 7, 8, 11, 14, 16, 17, 18, 20, 21, 26, 27, 35, 43, 50, 51, 56, 59, 60 and 62.

Table-1

Some Morphological Characters of Various Cultivars of Indian rice

Cultivars	Growth habit	Plant height (cm)
1	Erect herb	128.3
2	‘’	110.6
3	“	106.4
4	“	120.0
5	“	134.6
6	“	120.2
7	“	132.6
8	“	136.1
9	“	106.1
10	“	110.3
11	“	120.4
12	“	106.4
13	“	108.3
14	“	122.2
15	“	116.0
16	“	122.3
17	“	130.2
18	“	138.0
19	“	112.1
20	“	136.0
21	“	140.3

Cultivars	Growth habit	Plant height (cm)
22	“	114.6
23	“	108.2
24	“	112.5
25	“	112.4
26	“	139.4
27	“	141.2
28	“	110.6
29	“	110.6
30	“	98.7
31	“	107.5
32	“	104.4
33	“	105.3
34	“	103.4
35	“	140.7
36	“	102.3
37	“	105.3
38	“	108.6
39	“	112.3
40	“	105.3
41	“	107.4
42	“	104.2

Cultivars	Growth habit	Plant height (cm)
43	“	141.3
44	“	106.5
45	“	100.0
46	“	110.1
47	“	102.4
48	“	102.6
49	“	112.3
50	“	120.4
51	“	146.6
52	“	108.0
53	“	111.3
54	“	104.3
55	“	114.5
56	“	144.3
57	“	104.7
58	“	104.3
59	“	126.4
60	“	132.1
61	“	102.4
62	“	131.2

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