additive gene action. The hybrid MCU 5 x TCH 63/1 recorded negatively significant sca effects, in which both the parents involved are poor combiners, indicating non-additiveness for this character.

For shoot length, TCH 65/8 among lines and among testers LRA 5166 recorded significant and positive gca effects. Seven out of 28 crosses recorded significant and positive sca effects, in which atleast one of the parents was a good combiner indicating additive gene action. The maximum sca effects of 2.28 was recorded by the cross LRA 5166 x TCH 63/4 in which one of the parents is a good combiner. In other crosses recording positive sca effects involved parents which are poor combiners indicating non-additive gene action.

For vigour index TCH 63/7, TCH 65/8, TCH 70/7 and TCH 89/7 among lines and among testers MCU 7 recorded positively significant gca effects. Seven crosses recorded positively significant sca effects in which the parents involved are high x high, poor x high combiners and the maximum sca effect of 565.07 was recorded by the cross MCU 9 x TCH 70/7 in which atleast one of the parents is a good combiner. Hence additive and non-additive gene action is prevalent as for as vigour index is combined.

Based on gca effects (Table-1). the sparsely fuzzed line TCH 65/8 was found to be the good combiner for all the characters studied. But none of the testers was a good combiner. In fact, the high combiners for root length were high combiner for vigour index while high combiner for vigour index were high combiners for root length. This is possibly due to positive association between root length and vigour index. The intermating population involving all possible crosses among these genotypes and simultaneously subjected to biparental mating in early generations will offer maximum promise in breeding varieties with better seedlings characters and high vigour index. Further, only a few crosses had high sca effects for seedling characters. Thus there is little scope for exploitation of heterosis for any of these parameters.

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PHYSICO-CHEMICAL AND COOKING QUALITY OF SOME RELEASED AND PROMISING UPLAND RICE VARIETIES

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ABSTRACT

It was observed that there were significant differences for most of the physical parameters of paddy and rice. The appearance of all the varieties was translucent except kalinga-2 and shape of all the varieties was medium to slender. The proximate composition indicated that the protein and crude fat content of brown rice was in the range of 8.29 to 9.86 and 2 to 3.92 per cent respectively for all the rice cultivars. The water uptake of variety Ambemohar L. was higher and significant over all the varieties and the per cent volume increase was the highest for kalinga-2 followed by RHR- 1, Prabhavati and MAU-Sel-9. The swelling number for all the varities was in the range of 2.44 to 3.29.

India is one of the leading rice (*oryza sativa* L.) producing countries in the world with total production of 10.19 MMT (Anonymous, 1988). The market price and the consumers acceptability of the newly released rice varieties are largely dependent on the quality of the grains. Many reports are available on the chemical composition and cooking quality of several Indian rice varieties (Singh *et al.*, 1977). In the present study efforts were made to study some of the physico-chemical and cooking qualities of some released and promising rice varieties suitable for upland irrigated conditions on black soils.

MATERIALS AND METHODS

Paddy samples of 11 varieties namely SKL-27-29-12, PBNR-87-1, RHR- 1, MAU-Scl-9, PBNR-5, PBN-43, PBN-101, . Prabhavati, Kalinga-2, Ambika and Ambemohar L. grown in 1988-89 season under identical conditions were collected from Marathwada Agricultural University, Prabhani and study was conducted in 1989-90. Brown rice was obtained by dehulling the paddy by hand pounding.

Physical characteristics

The paddy and rice samples were evaluated for various physical parameters namely 1000 kernel weight and volume as per the procedure of A.A.C.C. (1976). Bulk density, density, porosity and angle of repose by using methods described by Kanawade *et al* . (1990). The length, breadth and length to breath ratio (L/B) were determined by using method stated by Bhashyam and Srinivas (1981). The colour of paddy and rice grains was measured by using Munsell colour charts. The seed hardness of rice was measured by using Hardson's seed hardness tester. The rice grains of all the varieties were classified for size and shape as per the classification given by Khush *et al.* (1979) and for quality as per the classification stated by Bala subramanian as referred by Soubhagya *et al. (1984).*

Chemical characteristics

The rice grains of each cultivar were evaluatec for moisture, protien, crude fat and ash by using A.C.C.(1976) methods.

Cooking characteristics : The cooking qualities such as water uptake and volume increase were measured by the method stated by Singh *et al* . (1977) and swelling number was determined and swelling capacity was noted as the ratio of volume increase after cooking to weight of sample. Falling number was determined by using falling number apparatus and expressed in terms of time in seconds. The alkali degradation test was performed according to the method stated by Little *et al.*, (1958).

RESULTS AND DISCUSSION

Physical parameters of paddy

The significant differences in physical parameters of paddy (Table 1) were observed among all the varieties. This indicates the variability amongst the genotypes in these characters. The test weight of PBNR-87-1 was significantly higher over all the varieties and volume of MAU-Sel-9 was at par with PBN-43 and PBNR-87-1 and significantly higher over rest of the varieties. The bulk density of Kalinga-2 (0.644g/cc) was significantly higher over all the

Table 1. Physical parameters of paddy from different cultivars.

Variety	1000 kernel Weight (g)	1000 kernel Volume (cc)	Bulk density (g/cc)	Density (g/cc)	Porosity (%)	Length (mm)	breadth (mm)	L/B ratio	Angle of repose (c)	colour
SKL-27-29-12	26.16	44.66	0.577	1.275	55.48	0.90	3.00	2.97	38.90	7.5y Rx7/6 (Redish yellow)
PBNR-27-1	33.33	55.00	0.606	1.200	54.61	10.16	3.00	3.39	37.66	10y Rx7/6 (yellow)
RHR-1	28.63	51.00	0.565	1.153	50.12	9.10	2.93	3.10	40.04	10yRx6/6 (Brownish yellow
MAU-Scl-9	28.66	55.66	0.521	1.133	14.54	10.83	3.00	3.61	39.05	10y Rx7/6 (yellow)
Prabhavati	28.00	51.0	0.548	1.263	50.18	10.17	2.90	3.50	38.70	10y Rx7/6 (yellow)
PBNR-5	30.33	51.83	0.585	1.100	50.21	9.90	2.90	3.41	37.66	2.5y Rx7/6 (yellow)
PBN-43	29.66	55.60	0.533	1.022	45.47	10.10	3.33	2.70	38.01	10y Rx8/6 (yellow)
Kalinga-2	25.33	39.33	0.644	1.291	54.71	7.93	3.03	2.62	38.70	10y Rx8/6 (yellow)
PBN-101	22.33	38.66	0.578	1.366	57.65	7.90	2.16	3.65	40.06	10y Rx8/6 (yellow")
Ambika	26.16	51.00	0.513	1.243	60.14	10.53	2.53	4.16	37.66	7.5y Rx6/6 (Dark brown)
Ambemohar L.	28.66	51.33	0.583	1.080	46.01	1.90	2.93	3.03	30.05	10y Rx/7/6 (yellow)
S.E. ±	0.8758	0.78681	0.0167	0.0158	0.1589	0.0627	0.0437	0.0903	0.0053	-
C.D. at 5%	2.5839	2.3213	0.0492	0.0465	0.4692	0.1851	0.1306	0.2666	0.0159	-

Table 2. Physical parameters of rice from different cultivars.

Variety	1000 kernel Weight (g)	1000 kernel Volume (cc)	Bulk density (g/cc)	Density (g/cc)	Porosity (%)	Length (mm)	Breadth (mm)	L/B ratio	Hardness (kg)	Angle of repose (c)	colour
SKL-27-29-12	18.60	25.10	0.741	1.36	45.51	5.33	2.03	2.62	5.67	47.87	10yRx7/4 (very pale brown)
PBNR-27-1	21.06	31.03	0.679	1.33	44.36	6.96	2.20	3.17	11.00	47.36	10yRx8/2 (white)
RHR-1	20.77	30.27	0.686	1.26	45.55	5.48	2.86	1.91	6.30	50.21	10yRx7/4 (very pale brown)
MAU-Sel-9	21.17	33.00	0.642	1.25	47.73	7.26	2.24	3.24	8.37	47.00	10yRx7/2 (Light gray)
Prabhavati	20.50	29.30	0.700	1.24	43.45	6.75	2.41	2.00	9.50	47.75	5yx8/2 (white)
PBNR-5	21.40	33.06	0.647	1.33	46.68	6.80	2.38	2.85	8.36	47.36	2.5yx8/2 (white)
PBN-43	23.10	33.00	0.705	1.10	36.80	6.50	2.76	2.36	8.83	47.08	2.5yRx5/6 (Red)
Kalinga-2	16.00	21.30	0.784	1.43	47.16	5.67	2.35	2.41	9.56	47.08	2.5yx7/4 (Pale yellow)
PBN-101	17.50	23.10	0.681	1.44	52.35	6.83	2.27	3.01	9.66	50.57	5yx7/2 (light grey)
Ambika	18.67	27.30	0.685	1.33	48.27	7.10	2.17	3.27	11.50	47.75	2.5yx7/2 (Pale yellow)
Ambemohar L.	20.50	28.30	0.724	1.29	43.87	6.10	2.20	2.77	8.00	47.75	10yRx8/2 (while)
S.E. ±	0.4676	0.4265	0.0294	0.0383	0.3911	0.0989	0.05543	0.0682	0.2341	0.0265	-
C.D. at 5%	1.3797	1.2583	N.S.	0.1145	1.1537	0.2916	0.1680	0.1923	0.6908	0.6908	-

N.S. - Non Significance

other varieties except PBNR-87-1 (0.606g/cc). The highest density has been recorded for PBN-101 and lowest for PBN-43. The length of MAU-Sel-9 (10.83 mm) was highest followed by Ambika, Prabhavati, and PBNR-87-1, while breadth was highest in case of PBN-43 (3.33 mm) followed by Kalinga-2 (3.03 mm). The length to breadth ratio was higher and statistically significant in case of Ambika over rest of the varieties and lowest in ease of Kalinga-2, PBN-43 and SKL-27- 29-12. The colour in all the varieties was yellow except SKL-27-29- 12, RHR-1 and Ambika cultivars. Similar results for physical parameters of paddy were recorded by Singh *et al* (1977).

Table 3. Classification of rice cultivars on the basis of physical parameters.

Variety	Size	Shape	Quality
SKL-27-29-12	Short	Medium	Fine
PBNR-87-1	Long	Slender	Super fine
RHR-1	Short	Bold	Coarse
MAU-Sel-9	Long	Slender	Super fine
Prabhavati	Long	Medium	Fine
PBNR-5	Long	Medium	Fine
PBN-43	Medium	Medium	Common
Kalinga-2	Medium	Medium	Common
PBN-101	Long	Slender	Super fine
Ambika	Long	Slender	Super fine
Ambemohar L.	Medium	Medium	Fine

Physical parameters of rice

The diferences for all physical parameters of rice (Table 2) were significaant except for bulk density. The test weight of rice of PBN-43 (23.10 g) was significantly higher over all the varieties and volume of thousand kernal grains of PBNR-5 (33.06 cc) was significantly higher over all the varieties except PBN-43 and MAU- Sel-9. The bulk density and density of the rice grains of all the varieties was in the range of 0.642 to 0.784 g/cc and 1.10 and 1.44g/cc respectively. Highest bulk density was reocrded by Kalinga-2 followed by SKL-27-29-12 and Ambemohar L. The highest per cent porosity was recorded by PBN-101 (52.35) and lowest by PBN-43 (36.80) rice variety. The length of rice grain of MAU-Sel-9 (7.26 mm) was at par with Ambika and PBNR-87-1 but significantly superior over other varieties. The highest L/B ratio of all the cultivars was 1.91 to 3.27. The results for L/B ratio are in good agreement with Soubhagya *et al* . (1984). The hardness of Ambika was highest and at par with PBNR-87-1 whereas significantly superior over other varieties. The white colour of rice grains was observed for PBNR-87-1, prabhavati, PBNR-5 and Ambemohar L.

The results of the classification of rice (Table 3) on the basis of length and L/B ratio indicated four rice varieties as long slender and super fine.

Table 4. Chemical parameters of rice cultivars.

Variety	Moisture %	Per cent on dry weight basis		
		Protein	Crude fat	Ash
SKL-27-29-12	9.85	9.34	3.68	1.98
PBNR-87-1	9.60	9.16	2.00	1.34
RHR-1	9.20	9.69	2.18	1.38
MAU-Sel-9	10.60	8.46	2.22	2.08
Prabhavati	9.60	8.99	2.46	1.76
PBNR-5	9.25	8.64	2.36	1.56
PBN-43	10.00	8.81	2.40	1.30
Kalinga-2	10.65	8.29	2.48	1.66
PBN-101	10.40	5.46	3.92	1.98
Ambika	10.45	9.86	2.64	1.08
Ambemohar L.	10.20	8.99	2.86	2.06
S.E. ±	0.0375	0.9310	0.00703	0.0052
C.D. at 5%	0.1107	N.S.	0.02070	0.0154

N.S. - Non Significant.

The apperance of all the varieties was translucent except Kalinga-2.

Chemical parameters of rice

The results for chemical parameters (Table 4) revealed that the moisture content of all the varieties was in the range of 9.20 to 10.65%. The protein content was in the range of 8.46 to 9.86% and varietal differences were non-significant. The crude fat content of PBN-101 was significantly higher over all the varieties followed by SKL-27-29-12. The ash content was highest in case of MAU-Sel-9 followed by Ambemoahr L. and lowest for Ambika and PBN-43. Similar results for other indian rice varieties were reported by Singh *et al* (1977);

Cooking qualities

The results presented in Table 5 indicated that the differences among varieties for all the cooking quality parameters were non significant except for water uptake and swelling capacity. The water up take was in the range of 1.65 to 2.20 g/g of rice. The water up take of Ambemohar L. variety was statistically significant over all the cultivars. Highest per cent increase in volume was recorded by Kalinga-2 followed by PHR-1, prabhavati and MAU-Sel-9. The per cent volume increase was in the range of 144.82 to 229.62. More the increase in volume and water absorption better was the quality of rice (Singh *et al* .,1977). However,though the volume increase in Kalinga-2 was highest, it's grain apperance, alkali degradation and falling number test indicated poor quality compared to others. The swelling number for all the varieties was in the range of 2.44 to 3.29. The swelling capacity of cultivar Kalinga-2 was highest and statistically significant over all the varieties except MAU-Sel-9, Prabhavati, PBN-100 and Ambemohar L. The alkalai degradation score for all the cultivar ranged from 2, to 7.0. Lower alkali degradation score indicated no sticky rice of all the varieties except SKL-27-29-12, PBNR-87-2 PBN-43 and Kalinga-2.

Table 5. Cooking quality characteristics of rice cultivars.

Variety	Water up take at 80°C (g/g)	Volume increase (%)	Swelling No.	Swelling capacity (cc/gm)	Falling No. (sec)	Alkali test score
SKL-27-29-12	1.75	207.14	3.07	2.60	1857	7.0
PBNR-87-1	1.65	144.82	2.44	2.10	2040	4.5
RHR-1	1.86	214.81	3.14	2.60	2010	3.5
MAU-Sel-9	1.89	211.11	3.11	2.85	2015	3.5
Prabhavati	1.95	213.70	3.03	2.75	2086	3.0
PBNR-5	1.80	196.29	2.96	2.65	2120	2.5
PBN-43	1.90	207.14	3.07	2.60	2005	4.5
Kalinga-2	1.90	229.62	3.29	3.10	1828	7.0
PBN-101	2.00	178.57	2.78	2.56	2090	4.0
Ambika	2.10	192.85	2.92	2.70	2050	2.5
Ambemohar L.	2.20	200.00	3.00	2.80	1950	2.5
S.E. ±	0.0128	0.5080	0.0187	0.1432	204.65	-
C.D. at 5%	0.0303	N.S.	N.S.	0.4226	N.S.	-

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EFFECT OF CHEMICAL WEED CONTROL ON GROWTH AND YIELD OF GROUNDNUT

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ABSTRACT

The effect of certain pre-emergence herbicides on the gowth and yield of two bunch groundnut varieties was field tested. The chemical weed control methods increased plant growth in terms of leaf area and dry matter. The chemical treatments gave higher pod yields in both the varieties by better weed control efficiency. The chemical treatments were compared with hand weeding given twice on 15 and 40 DAS. Among the chemicals imazethapyr at 2.30 kg ha^{-1} gave higher yield through effective weed control.

Weed problem is very severe in the initial stages of growth of groundnut crop. The rate of growth of the groundnut crops being slow at the early stages, the weeds compete for the available water and nutrients. Maximum ground coverage is attained only around 60 days after sowing especially in bunch types. It is generally estimated that the yield of groundnut is reduced by 25 to 50% due to competition by weeds (Sankara Reddi, 1982). Earlier studies using herbicides indicated that fluchloralin affected crop stand in groundnut (Kulandaivelu et al., 1978). Alachor at 1.5 kg ha^{-1} was found to have effective control (Kulandai velu and Sankaran, 1976). However information regarding the effect of chemical weed control on the growth behaviour of the groundnut is lacking and hence the present study was undertaken with the object of understanding the influence of chemical weed control on the growth and yield characteristics of groundnut.

MATERIALS AND METHODS

A field experiement was conduced during February-May 1991 season in an exporimental field of the University with red sandy loam soil. The bunch varieties viz., CO 1 and CO 2 were employed. The experiement was laid down in a factorial randomised block design with three replications and ten treatments. The treatments were as follows, T1 - Unweeded control, T2 - Hand weeding, T3 - Pendimethalin (1.0 kg ha^{-1}), T4 - pendimethalin (1.5 kg ha^{-1}), T5 - Metolachlor (1.0 kg ha^{-1}), T6 - metochlor (1.5 kg ha^{-1}), T7 - Oxyfluorfen (0.10 kg ha^{-1}), T8 - Oxyfluorfen (0.15 kg ha^{-1}), T9 - Imazethapyr (0.15 kg ha^{-1}), T10 - Imazethapyur (0.20 kg ha^{-1}). In the treatment T2 handweeding was done at 15 and 40 days after sowing. The herbicide treatments were given as pre-emergence sprays.

A NPK dose of 17,34 and 54 kg ha^{-1} was given basally. A spacing of 13 x 15 cm was adopted. Data on plant growth characteristics viz., leaf area index, and dry matter production and yield parameters viz., number of pegs, number of pods, pod yield, harvest index, shelling percentage were recorded besides observations on weed density and weed control efficiency.