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AGRONOMIC CHARACTERS OF LANDRACE YELLOW-RICE (*ORYZA SATIVA* L.) SELECTED ACCORDING TO PLANT HEIGHT AND PANICLE PROPERTIES

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Abstract

Landrace yellow-rice (*Oryza sativa* L.) has a wide variation in terms of agronomical characters. This research was carried out to determine the agronomic characters of landrace yellow-rice by selection works for three years. In the research, mass selection method was used. At the beginning, from the farmers' fields, plant selection was made according to phenotypical characters (plant height, panicle length and spikelet form) at physiological maturity. The selected plants were threshed and planted in the first year. The plants selected in the first year was harvested and threshed collectively and investigated in terms of panicle and grain properties. Plant selections and investigations were repeated in the second and third years. On the selected plants; tiller number, stem length, panicle height, grain number per panicle, grain weight per panicle, 1000 grain weight, test weight and length of grain were examined for three years and average values belong to examined properties were 4.47, 94.61 cm, 19.50 cm, 126.85, 2.97 g, 26.38 g, 55.15 kg and 6.23 mm, respectively. Additionally, variance, standard deviation and coefficient of variation were calculated for examined properties. According to the results of three years, landrace yellow-rice were determined as homogenous for investigated traits.

Introduction

Rice is widely used in different forms as food, such as pilaf, soup, dessert, infant food (Su *et al*., 2008). Rice is being more and more used in kitchens day by day. In addition to this, there are important fluctuations in rice sowing areas in Turkey and most of the rice landraces are in danger of extinction.

While rice planted area was 75000 hectare in 1994 (Anon., 1994), it declined to 60 000 ha in 1999 in Turkey (Anon., 1999). However, it reached to 80 000 ha, in recent years (Anon., 2007). Because of inadequatel mechanized to production of the other crop plants, import with lower prices, increasing in production cost, etc. cause fluctuations in rice planted areas. Among the other factors affecting these fluctuations were irrigation water deficiency, and the other crop plants supplying higher profit in a unit area than rice (Young Neng *et al*., 2005; Bhat & Gowda, 2004).

The adaptation works started with testing of foreign rice cultivars by Tarsus & Yeşilköy at the Agricultural Research Stations in 1964. Local rice landraces were produced as primary and second crops until 1980. Local rice research projects were started by Ministry of Agriculture and Forestry in 1981 (Anon., 1981). These landraces remained in danger of extinction. These rice landraces are accepted as important genetic resources for agronomic and quality traits. Little research work on the characters of these rice landraces is reported.

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Landrace yellow-rice is highly preferred by local people but it is a non-registered cultivars and this landrace has long vegetation duration (Bhat & Gowda, 2004). Since it was a landrace population, it had wide variation in terms of many properties. So, this landrace must be conserved as a population, beside in purification works for agronomic characters such as plant height and panicle properties. It was advised that some genetic researches should also be carried on landraces (Joshi *et al*., 2007; Rabiei *et al*., 2004).

As a genetic resource, Landrace Yellow-rice which was in danger of extinction had important agronomic and quality properties for both country and region. However, there is not any available research on the conservation and improvement properties of yellow-rice landrace in literature. Whereas, there has been intensive studies all over the world about the conservation of genetic materials and the issue has been gaining importance as the natural resources diminish (Yano & Sasaki, 1997; He *et al*., 1999; Rabiei *et al*., 2004).

Since mass selection method is relatively easier, it is highly preferred by researchers and there have been positive improvements in landraces selected with this method (Gravois & Mc New, 1993; Jannink *et al*., 2000; Almekinders & Elings, 2001; Gyawali *et al*., 2007).

The aim of this research was to determine the agronomic characters belong to Landrace yellow-rice and to apply selections in order to improve its agronomic characters, after collections and conservation works.

Material and Methods

The research was carried out in Kahramanmaraş located in Eastern Mediterranean region between 37° 36[1] north parallels and 46° 56[1] meridians and Landrace yellow-rice was used as material. The selection of the plants was made in the fields of the farmers in which the mentioned landrace were planted. The landraces is highly preferred by local people due to its quality traits, and so planted by the local farmers.

First collection and conservation works were applied on landrace yellow-rice population. Since Landrace Yellow-rice was in a mixed population, its properties were tried to be purified. In this study mass selection method was used. First of all, the researchers and experienced farmers collected materials from 7 different rice-planted fields. In the selected plants; plant height, length of panicle and form of panicles were paid attention. The seeds of the selected material were planted on April 27, 1997 collectively and in the physiological maturity time 5000 plants were selected and harvested together on the last week of September and after being threshed they were preserved for the second year. The selected material was planted collectively in the second year on April 21, 1998 and 5000 plants were selected and both harvested and threshed together (Kün, 1985; Sehirali & Ozgen, 1998). The seeds were sown on May 5th, 1999 and harvested and threshed on October 25, 1999 in the third year. Experimental material was randomly scattered to plots with four replications for three years. Fertilizers were applied at rate of 20 kg P_2O_5/ ha and 20 kg N/ha at sowing time and 140 kg N/ ha were also applied as top dressing at tillering.

The following characters were investigated according to Gevrek (1995):

1. Tiller number: it was defined by counting of the tillers.
2. Stem length (cm): it was measured from stem of plant on soil to lowest note of panicle.
3. Length of panicle (cm) was measured from base of lowest spikelet to the top of latest spikelet on panicle excluding of awn.

4. Grain number per panicle (number) was defined by counting of the grains on per sampled panicles.
5. Grain weight per panicle (g) was defined by weighing of grains of per sampled panicles
6. 1000 grains weight (g) : 100 grains were counted four times and they were weighed, then 1000 grain weight were calculated from these weights.
7. Test weight (kg/hl): it was defined with scale cape
8. Length of grain (mm) : chaff grain length was measured by using digital compass.

These characters were measured on randomly selected 60 plants, 100 plants and 40 plants for the first, second and the third year, respectively.

Results and Discussion

The tiller number, stem length, panicle length, grain number per panicle, grain weight per panicle, 1000 grain weight, test weight and grain length of landrace yellow-rice were measured and average results are given in Table 1. This landrace yellow-rice was tried to be purified during three years (1997-1999) by means of mass-selection method and variance, standard deviation and coefficients of variation are given in Table 1.

In the first year, from the selected rice plants; tiller number, stem length, panicle length, grain number per panicle, grain weight per panicle, 1000 grain weight, test weight and grain length were determined as average 4.10, 83.95 cm, 18.10 cm, 81.42 grains, 2.31 g, 27.9 g, 57.37 kg and 6.15 mm, respectively (Table 1). When the values obtained from the plants selected in the second year were examined, we observed that 1000 grain weight and test weight decreased but the other values increased (Table 1).

In the third year, stem length, grain weight per panicle and grain length increased and obtained average values were determined as 105.95 cm, 3.34 g and 6.29 mm respectively. 1000 g weight and test weight increased to 26.44 g and 55.21 kg, respectively in the third year. The grain number per panicle significantly increased in the second year compared to the first year and it was determined as 133.39 grains in the third year. Tiller number was determined as 4.10, 5.63, and 3.7 in the first, second and third years, respectively which increased in the second year, it was measured as lower in the third year than that of the first year.

When the variance, standard deviation and coefficient of variation values related with properties measured in the years were examined, all the values were decreased in the third year. Coefficient of variation values of tiller number and grain number per panicle were determined as 23 % and 17.87 %, respectively. Standard deviation value of grain number per panicle were also determined as 23.93. These coefficient of variation and standard deviation values were in consistent with the findings of previous researchers (Ulger & Genc, 1989; Beser & Genctan, 2001; Surek, 2002; Ghosh *et al*., 2004)**.** They reported that the tiller number and grain number per panicle were affected by the environmental and cultivation factors. Moreover, Bhat & Gowda (2004) reported that there would be an important variation in tiller number and this was in agreement with our findings. Increasing in stem length, grain number per panicle, grain weight per panicle and grain length might have stemmed from taking into account of these properties as selection criteria. These properties were reported as important selection critera (Gyawali *et al*., 2007; Virk *et al*., 2006; Rabiei *et al*., 2004). These results are similar to our findings.

Table 1. The values related with the features of selected rice plant and variance, standard deviation and coefficient of variation of these values for the respecteal years.

Features	Everage value			Variance			Standart deviation			Coefficient of variation (%)		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
Tiller number	4.10	5.63	3.7	1.55	2.25	0.73	1.25	1.50	0.85	30.35	26.66	23.00
Stem length(cm)	83.95	93.94	105.95	49.37	82.88	42.20	7.03	9.10	6.50	8.36	9.69	6.13
Length of panicle (cm)	18.10	22.06	18.36	4.09	10.03	2.08	2.02	3.17	1.41	11.17	13.99	7.84
Grain number per panicle	81.42	165.21	133.93	625.94	986.31	572.69	25.02	31.41	23.93	30.72	19.01	17.87
Grain weight per panicle (g)	2.31	3.27	3.34	0.11	0.20	0.09	0.34	0.45	0.30	14.55	13.69	9.02
1000 Grain weight (g)	27.90	24.81	26.44	0.18	0.18	0.13	0.43	0.42	0.36	1.53	1.71	1.38
Test weight (kg)	57.37	52.89	55.21	5.35	1.19	0.47	2.31	1.09	0.68	4.03	2.06	1.24
Grain length (mm)	6.15	6.27	6.29	0.03	0.03	0.02	0.18	0.16	0.13	2.96	2.68	2.00

In the third year of the research, the tiller number of landrace yellow-rice was 3.7, variance, standard deviation and coefficient of variation were at the minimum values (Table 1). Surek (2002), reported that tiller number under field conditions changed in the range of 1-3 and this property changed according to the species, strength of plant, sunlight, nutrition, the duration in which the field stayed under water, the level of water and the number of plant in unit area. Similar results were also reported by Aide & Beighly (2006) and Manzoor *et al*., (2006).

It was reported that stem length of landrace yellow-rice was 105.95 and variance, standard deviation and coefficient of variation were at the minimum value (42.20, 6.50, 6.13) in the last year (Table 1). It was reported that the plant height values obtained from the other researches (70-100 cm) were lower than that of ours (105 cm) (Anon., 1991; 1993; 2008; Joshi *et al*., 2007). Plant height was affected by many factors like plantation method, plant density and fertilizer application (Beser & Genctan, 1999; Aide & Beighly, 2006; Gozubenli, 1992).

It was found that length of panicle was 18.36 cm and variance, standard deviation and coefficient of variation values were at the minimum values in the third year (Table1). In previously conducted researches, the length of panicle was 12-19 cm (Anon., 1991, Anon., 1993). This value changed in the range of 16.7-17.8 cm according to the plantation method and these values were less than that of ours (Beser & Genctan, 1999).

In the last year, the grain number per panicle was 133.93 and variance, standard deviation and coefficient of variation were at the minimum values (Table 1). It was reported that environment and cultivation method had an effect on grain number per panicle (Gozubenli, 1992; Aidei & Beighly, 2006; Manzoor *et al*., 2006)

Grain weight per panicle was 3.34 g in the last year, it was determined that variance, standard deviation and coefficient of variation were at the minimum values (Table 1). In the previous research (Anon., 1991), the grain weight per panicle (0.74-1.98 g) was less than that of ours. Gozubenli (1992) reported that the grain weight per panicle was at most 2.92 g and it was affected by the rate of fertilizer and plant density.

In the third year, 1000 g weight was measured to be 26.44 g and variance, standard deviation and coefficient of variation values were at the minimum. It was reported that the 1000 g weight of introduction materials were in the range of 24-25 g, it was 27-40 g for other species and lines (Anon., 1991, 1993, 2008). These findings were higher than the values we obtained (26 g). According to Surek & Beser (1996) and Manzoor *et al*., (2006), 1000 g weight was affected by cultivation methods. However, Aidei & Beighly (2006) reported that cultivation methods didn't have a such an effect on 1000-grain weight.

In the last year, the test weight was 55.21 kg and variance, standard deviation and coefficient of variation were at the minimum values. In previous reports, test weight was measured in the range of 46.6-53.8 kg (Anon., 1991) and this value could reach to 51.77-54.57 kg depending on the selected irrigation method (Beser & Genctan, 2001). Jones *et al*., (1947) reported that test weight could vary significantly depending on the years and sites.

In the last year, it was recorded that the length of grain was 6.29 mm and variance, standard deviation and coefficient of variation were at the minimum values. In the previous researches (Anon., 1991; 2008) grain length was in the range of 7-10 mm and higher than that of ours.

Conclusion

As a result of 3-year-researches made on landrace yellow-rice, tiller number, stem length, length of panicle, grain number per panicle, grain weight per panicle, 1000 grain weight, test weight and grain length were examined and the average results were 4.47, 94.61 cm, 19.5 cm, 126.85, 2.97 g, 26.38 g, 55.15 kg and 6.23 mm respectively. Upon observing the decreasing in variance, standard deviation and coefficient of variation in the last year, we decided that landrace yellow-rice purified for investigated traits. The rice obtained from this landrace yellow-rice is highly preferred by the local people in the region. Landrace yellow-rice should be conserved especially for its aromatic and genetic features. Maintenance of this landrace will provide an important genetic source for future researches.

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