American-Eurasian J. Agric. & Environ. Sci., 16 (3): 571-576, 2016
ISSN 1818-6769

DOI: 10.5829/idosi.aejaes.2016.16.3.12875

Effect of Different Transplanting Dates on Germplasm Rice Yield and its Yield Components

[1]Hasnain Nangyal, [1]Azhar Hussain Shah and [2]Noreen Akhtar

[1]Department of Botany, Faculty of Sciences, Hazara University, Khyber Pakhtoonkhwa, Pakistan
[2]Department of Botany, G.C Women University Faisalabad 38000, Faisalabad, Punjab, Pakistan

Abstract: This study was carried out at Agriculture Research Institute Mingora Swat". Seven advance varieties of rice (PK 3445-3-2, OM 5627, IR 64, IR 8225-9-3-2-3, CIBIGO, Japonica, FakhriMalakand) were assessed with response to two transplanting dates (July 9, July 24) for quantitative and qualitative characterized in this study. Mean value for qualitative and quantitative characters were evaluated according to least significant difference (LSD) by statistical test. Data on morphological structures (Both qualitative and quantitative) of every plant stage of development were studied and check their productivity. Varietal individuality and its portrayal were verified according to its standard results. The material displayed shows substantial contradiction for qualitative and quantitative characters with few exemptions. Statistical investigation of data showed that maximum number of days to flowering was recorded which is planted on 24 July (78.2), early planted plot attained greater plant height maximum leaf length of 24 July planted plot which is (29.15), similarly minimum number of grains per panicle was produced on 24 July which is (34.32). Thousand grains weight and those varieties which were planted on 9 July which is (19.96) have minimum thousand grains weight mean value and maximum yield was obtained from that variety which was planted on the same date which is (445.23). These varieties could be cultivated under agro climatic conditions of district Swat to get maximum yield. As our findings showed great variations in morphological, physical and agronomical traits of rice varieties. These variations may be exploited to develop high yielding and high quality rice either through breeding or by genetic engineering tools.

Key words: Transplanting dates · Rice varieties · Yield and yield components

INTRODUCTION

More than 1000 of year's rice most widely used by human beings as staple food. It has been used vastly by number of people for a prolonged time than any other crop at the moment. It has importance as national food security that has increased even in countries where it is not the traditional staple food. Rice *(Oryza sativa*) is a food and its utilization is rising day by day in all over the world. The significance of rice (*Oryza sativa)* is ever more renowned in holy and public ceremonies [1].

50% of every day basis intake calories obtained from rice that is vital crop in respect of nutritional value [2, 3]. 27% of nutritional energy and 20 of dietary protein obtained from rice [4]. Rice (*Oryza sativa)* is a source of, thiamin, Zinc, phosphorus, copper, vitamin B6, magnesium and niacin. A few species of rice have folic acid, potassium and iron. Among all varieties of rice white rice is poor in proteins; several enhanced varieties of rice however might supply 14 grams of protein per 100 grams. Rice consists of protein, fat, carbohydrates, reasonable amount of riboflavin and calcium [5].Rice provide considerable amount of proteins and energy to earth inhabitants. Rice is collected as a live stock from industrial and non industrial employ. More than billion people in the world used the rice because it has essential food components [6].

Rice (*Oryza sativa* L.) is a member of Poaceae family of the Oryzeae tribe. Twelve genera are present in tribe *Oryzeae*. The genus *Oryza* contains about 22 species among them 20 is wild and 2 i.e. (*Oryza glaberrima* and *Oryza sativa)* are cultivated (The biology and ecology of rice in Australia, 2005). The cultivated rice (*Oryza sativa*) is distinguished by two major species Indica and Japonica on the basis of morphological distribution and morpho-physiological variations [7, 8]. *Oryza sativa* has relatively small genome (2n=24) with a size of 389 Mb and contain 37,544 genes. Overall of 2859 genes look like to be distinctive to *Oryza sativa* and other cereals, a few of which distinguish lineages of monocot and dicot

Corresponding Author: Hasnain Nangyal, Department of Botany, Faculty of Sciences, Hazara University, Khyber Pakhtoonkhwa, Pakistan.

(International Rice Genome Sequencing project, 2005). Rice got most importance in all the cash crops. Round about 1.2 billion dollars have been obtained by Pakistan by foreign exchange and by trading of rice [9]. The normal acquiesce of rice in Pakistan has been greater than earlier as a effect of numerous actions by extra than 4% annually but at rest far less than other foremost rice rising states [10].

Rice production needs increase to meet the forecasted stress of growing population. Important alternative is to enlarge the region under rice agriculture, which is receiving stiffness as extra ranch region are being rehabilitated to housing areas in the rising world. Additional, being the clip foodstuff for the majority of the mounting world, the dietary development of rice can also assist to decrease undernourishment [11].

In spite of environmental factors such as heat, cold, drought, salinity, ailment and vermin etc. which results destruction about 50 percent of total rice crops. Since too early on or too delayed transplanting consequences harvest infertility and inferior number of creative tillers, in that order [12]. To achieve high grain yield transplanting of rice in most favorable date is necessary. Though, most favorable rice planting dates are local and differ with site and varieties [13, 14].

Sowing dates also affect paddy yield by providing a variety of ecological circumstances, up till now high temperature is the input issue to be exaggerated by sowing dates in average granule rice. This is for the reason that, increase and acquiesce of non-basmati rice is slight or not pretentious by the other climatic factors particularly day length owing to its no photosensitive natural history in dissimilarity to basmati rice [15].

MATERIALS AND METHODS

In order to evaluate the effect of transplanting date on yield and yield components of rice genotypes in agro climatic conditions of District Swat, an experiment was conducted at Agricultural Research Institute (ARI), Mingora, Swat during 2012.

Sowing Dates:
Date 1, July 9, 2012
Date 2, July 24, 2012.

Varieties: Seven Varieties Variety 1 (V1) PK 3445-3-2, Variety 2 (V2) OM 5627, Variety 3 (V3) IR 8225-9-3-2-3, Variety 4 (V4) CIBOGO, Variety 5 (V5) Japonica, Variety 6 (V6) FakhreMalakand and Variety 7 (V7) IR 64) were selected in order to study effect of different transplanting dates on yield and yield components.

Experimental Site and Field Operation: Plot size was kept 6m×4m before transplanting and all varieties were transplanted on their respective dates i.e. sufficient amount of NPK (Nitrogen Phosphorus and Potassium) was incorporated to soil before ploughing process and remaining part provided to the plant after 25 and 45 transplanting days, respectively to ensure the correct timing for fertilizer. The field was prepared thoroughly and was planked into smoother surface for proper growth of rice plant. Standard agronomic practices were carried out throughout the season for all varieties equally i.e. proper irrigation, weeding, soil analysis and proper check of fertilizer dose in proper time. Data was collected on the following plant parameters.

Days to 50 % Flowering: Data on days to 50 % flowering was recorded by counting the number of days from the date of transplanting consecutively till the date when 50 % of the plants produced panicles. In this regard the field was examined thoroughly and data was collected accordingly.

Leaf Length: Leaf length was determined by taking three leaves randomly from a plot and its length was recorded by measuring length wise as a result three readings were obtained then averaged.

Leaf Width: Leaf width was determined by taking three leaves randomly from each plot and then averaged.

Number of Tillers per Hill: Data for tillers per hill was recorded by counting randomly three tillers in each plot then averaged. Number of tillers falling inside one square meter wooden quadrant was determined.

Days to Maturity: Data was recorded when 90% of the panicles got maturation by counting the number of days from transplanting till maturity i.e. (dates of harvesting).

Thousand Grains Weights: After completion of threshing process a representative sample of 1000 grains were taken at random from four central rows of each subplot and then weighed by a sensitive electronic balance to record data in grams concerning 1000 grains weight.

Yield: Yield data was determined in grams, by weighing four central rows from each subplot when it is harvested and threshed.

Statistical Analysis: Statistical analysis was done for the above mentioned traits by the help of Statistix 8.1 and SPSS 16.0. Analysis of variance (ANOVA) and Least Significant Differences (LSD) was done by the help of Statistix 8.1 while correlation analysis was done with the help of SPSS 16.0.

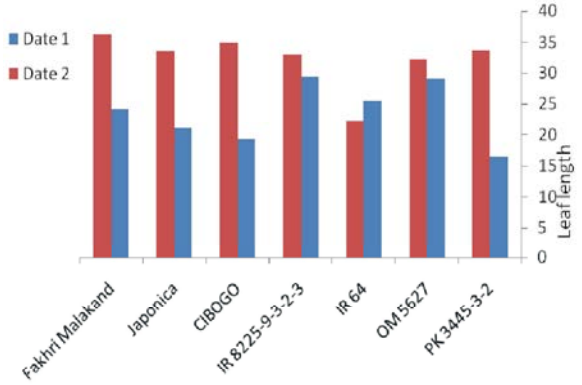
RESULTS

Leaf Length: Analysis of the variance data are presented in Table 1 revealed that planting dates and varieties significantly ($P \leq 0.05$) affected leaf length. Mean values of the data revealed that maximum leaf length of 32.25 cm were obtained from those plots which `were planted on 24 July, while minimum leaf length 24.13 cm were obtained from those plots which were planted on 9 July. Mean values of the data also revealed that variety OM 5627 produced maximum leaf length of 30.65 cm followed by variety FakhriMalakand having leaf length of 30.18 cm, whereas variety IR 64 produced the minimum leaf length of 23.76 cm. The Least Significant Difference (LSD) values for leaf length for different planting dates are presented in Table 1.

Table 1: Leaf length of various rice genotypes as affected by different planting dates and varieties

	Sowing Date		
Varieties	Date 1	Date 2	Means
PK 3445-3-2	16.500F	33.767C	25.13
OM 5627	29.033A	32.267E	30.65
IR 64	25.433B	22.100F	23.76
IR 8225-9-3-2-3	29.433A	33.000D	31.21
CIBOGO	19.400E	34.867B	27.13
Aponica	21.133D	33.567C	27.35
FakhriMalakand	24.133C	36.233A	30.18
Means	23.58	32.25	
LSD value at alpha level 0.05	1.2935	0.3946	

Table 1 showed that IR 8225-9-3-2-3 shows maximum leaf length 31.21.

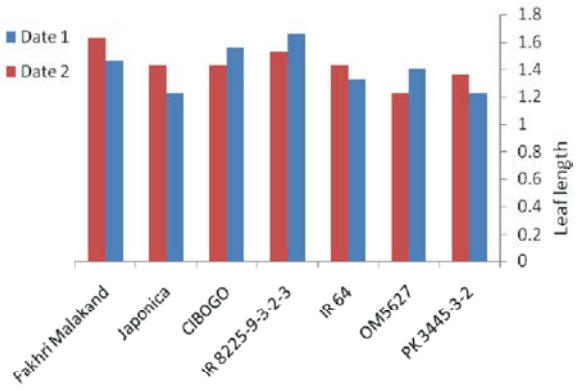


A similar inclination is noticeable in leaf length of CIBOGO i.e. (27.13) and Japonica i.e. 27.35 which are statistically similar to one another in terms of leaf length with respect to different transplanting dates. In similar conditions the leaf length of Japonica (27.35) and CIBOGO (27.13) shows statistical affinity to leaf length of Fakhri Malakand(30.18).

Leaf Width: Table 2 shows that data regarding leaf width in cm. Statistical analysis of the data showed that there was significant (P = 0.05) differences in leaf width due to planting dates and varieties. It is clear from the Table 2 that leaf width was maximum (1.43 cm) in those plots which were planted on 24 July and minimum (1.41 cm) in those plots which were planted on 9 July. Similarly varietal means also indicated that maximum leaf width (1.59 cm) was produced by variety IR 8225-9-3-2-3, whereas minimum leaf width (1.29 cm) was produced by variety PK 3445-3-2 followed by variety OM 5627 having 1.31 cm leaf width. The Least Significant Difference (LSD) values for leaf length for different planting dates are presented in Table 2.

Table 2: Leaf width of various rice genotypes as affected by different planting dates and varieties

	Sowing Date		
Varieties	Date 1	Date 2	Means
PK 3445-3-2	1.2333E	1.3667C	1.29
OM 5627	1.4000CD	1.2333D	1.31
IR 64	1.3333DE	1.4333C	1.38
IR 8225-9-3-2-3	1.6667A	1.5333B	1.59
CIBOGO	1.566AB	1.4333C	1.49
Japonica	1.2333E	1.4333C	1.33
FakhriMalakand	1.4667BC	1.6333A	1.54
Means	1.41	1.43	
LSD value at alpha level 0.05	0.1098	0.1470	0.0839



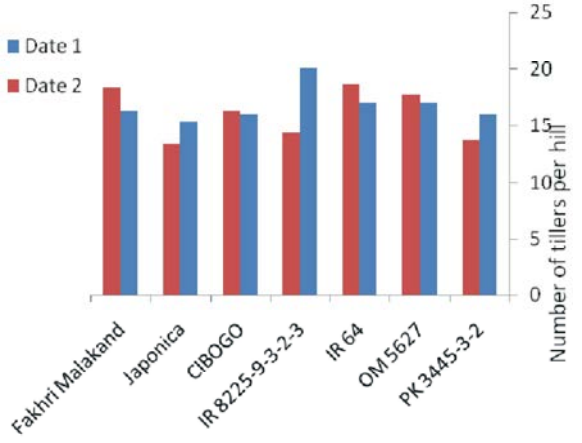
Leaf width was the most important parameter of the present study and was recorded by measuring the leaves of three randomly selected plants in each plot. Results of the study showed that IR 8225-9-3-2-3 has maximum leaf

width (1.59) which is statistically similar to Fakhri Malakand (1.54). Average leaf width of Japonica and OM 5627 i.e. (1.33) and (1.31) is statistically similar to IR 64 (1.38).

Number of Tillers per Hill: Regarding to the number of tillers per hill is shown in Table 3. The results revealed that there were significant (P = 0.05) differences in number of tillers per hill due to planting dates and varieties. Mean values of the data shown in Table 3 revealed that maximum number of 16.80 tillers was recorded for plot planting on 9 July. Variety IR 64 took maximum number 17.83 of tillers per hills while variety Japonica took the minimum number 14.33 of tillers per hill. The Least Significant Difference (LSD) values for plant height for different planting dates are presented in Table 3.

Table 3: Number of tillers per hill of various rice genotypes as affected by different planting dates and varieties

	Sowing Date		
Varieties	Date 1	Date 2	Means
PK 3445-3-2	16.000C	13.667C	14.83
OM 5627	17.000B	17.667A	17.33
IR 64	17.000B	18.667A	17.83
IR 8225-9-3-2-3	20.000A	14.333C	17.16
CIBOGO	16.000C	16.333B	16.16
Japonica	15.333D	13.333C	14.33
FakhriMalakand	16.333C	18.333A	17.33
Means	16.80	16.04	
LSD value at alpha level 0.05	0.5714	1.2579	



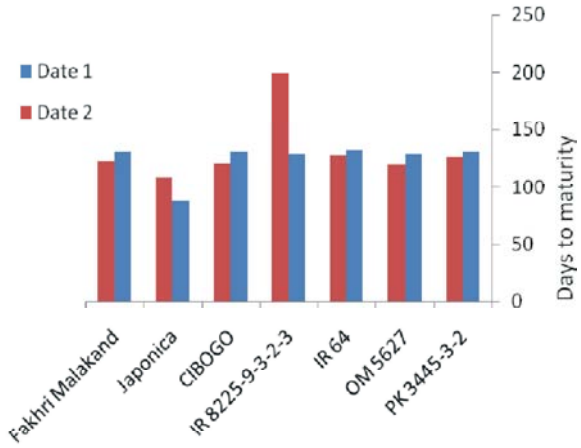
Number of tillers per hill was calculated in three erratically selected plants per plot and after that average is taken and then means values are calculated and measured.

Data in Table 3 shows statistically significant resemblance (P ≤ 0.05) between FakhriMalakand and OM 5627 in terms of tillers per hill. Average numbers of tillers per hill shows that FakhriMalakand (17.33) and OM 5627 (17.33) belongs to statistically similar group. Results also exposed that all transplanting dates have shown a statistically significant increase over control.

Days to Maturity: Regarding to days to maturity is presented in Table 4. Statistical analysis of the data revealed that days to maturity had a significant effect (P ≤ 0.05) due to planting dates and varieties. The mean values of planting dates showed that highest number (123.57) of days to maturity was taken by plot planted on 9 July. Varietal means also indicated that varieties IR 64 took maximum of 129 days to maturity, while Japonica took minimum of 97.83 days to maturity. The Least Significant Difference (LSD) values for days to maturity for different planting dates are presented in Table 4.

Table 4: Days to maturity of various rice genotypes as affected by different planting dates and varieties

	Sowing Date		
Varieties	Date 1	Date 2	Means
PK 3445-3-2	130.00B	126.00A	128.00
OM 5627	128.00C	120.00C	124.00
IR 64	132.00A	127.67AB	129.83
IR 8225-9-3-2-3	128.00C	199.33BC	163.66
CIBOGO	130.00B	121.00AB	125.50
Japonica	87.00D	108.67D	97.83
FakhriMalakand	130.00B	123.00B	126.50
Means	123.57	120.80	
LSD value at alpha level 0.05	1.8618	4.9207	



Product of the study assesses noteworthy differentiation (P = 0.05) among dissimilar varieties with respect to transplanting dates. IR 64 with common 129.83 days took more days to maturity than 128.00 of PK 3445-3-2.

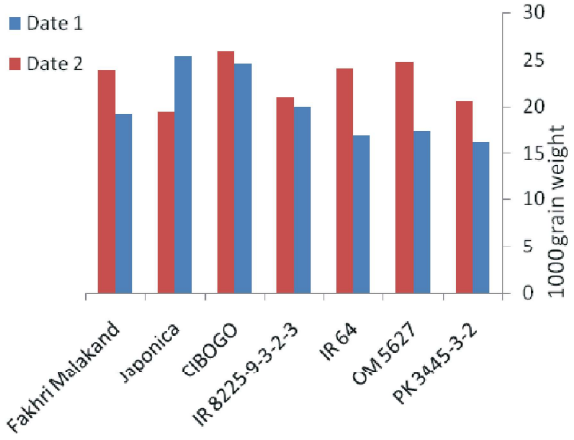
1000 Grains Weight: Regarding to 1000 grains weight is presented in Table 5. Analysis of the data revealed that

there were significant (P = 0.05) differences in number of tillers per hill due to planting dates and varieties. Among planting dates, maximum of 22.81g of 1000 grains weight were taken from the plot which was plotted by 24 July, while minimum of 19.96 g of 1000 grain weight were taken by plot which was planted on 9 July. Varietal means also showed that CIBOGO produced a maximum of 25.33 g of 1000 grains weight, while a minimum (23.12 g) 1000 grains weight was produced by PK 3445-3-2 followed by Japonica (18.40 g), OM 5627 (21.03 g) and IR 64 (20.46 g). The Least Significant Difference (LSD) values for 1000 grains weight for different planting dates are presented in Table 5.

Table 5: 1000 grains weight of various rice genotypes as affected by different planting dates and varieties.

	Sowing Date		
Varieties	Date 1	Date 2	Means
PK 3445-3-2	16.200C	20.600C	18.40
OM 5627	17.333C	24.733B	21.03
IR 64	16.867C	24.067B	20.46
IR 8225-9-3-2-3	20.000B	21.000C	20.5
CIBOGO	24.667A	26.000A	25.33
Japonica	25.400A	19.400D	22.40
FakhriMalakand	19.267B	23.933B	21.59
Means	19.96	22.81	
LSD value at alpha level 0.05	1.6679	1.0989	

1000 grains weight was documented by erratically choosing 1000 grains from every transplanting date.



Data in Table 5 demonstrated that statistically significant disparity (P ≤ 0.05) between transplanting dates of different varieties. Statistical difference was pragmatic between OM 5627 (21.03) and CIBIGO (25.33) which are statistically different from each other. Likewise OM 5627 (21.03) and IR 8225-9-3-2-3 (20.50). Likewise 1000 grains weight of FakhriMalakand and Japonica in all transplanting dates remained statistically significant.

DISCUSSION

Leaf length was highly significant due to planting dates and varieties. Mean values of the data revealed that maximum leaf length of 32.25 cm were obtained from those plots which were planted on 24 July. This might be due to the availability of more favorable conditions especially temperature and day length. It is evident from the results that July might have favorable climatic conditions for maximum production of vegetative and reproductive components.

Analysis of the data revealed that there were significant differences in number of tillers per hill due to planting dates and varieties. Mean values of the data shown that maximum number of 16.80 tillers was recorded for plot planting on 9 July. These results indicated that delay in planting had increased number of tillers per hill due to high temperature. These results are against with the results of Gangwar and Sharma [16], who observed that more number of tillers in early transplanting than in late transplanting. This contradiction may be due to variation in environment.

Data recorded for days to maturity revealed that both planting dates and varieties had significantly affected days to maturity. The probable reason that the rice crop required optimum conditions for maturity especially the temperature and light for completing their life cycle.

Data recorded on 1000 grains weight revealed that both varieties and planting dates had significant affect on 1000 grains weight. Those plots which were planted on 24 July, showed maximum 1000 grains weight, while those plots which were planted on 9 July, showed minimum 1000 grains weight. The possible reason for this could be the presence of unfavorable climatic conditions due to which more sterile panicles were produced per plant. These results are in line with those obtained by Tari *et al*. [17] and Akbar *et al.* [18], they reported that 1000-grain weight was gradually decreased as the sowing was delayed.

CONCLUSION

The overall results of the present investigations lead us to the conclusion that there is a significant effect of transplanting dates on the yield, yield components and days taken to 100% flowering of fine grain rice genotypes. Transplanting during 1st to 15 July is most suitable for obtaining better yields of fine grain rice genotypes. All the rice genotypes under studies were found to be photoperiod sensitive and hence true basmati except 98410 which was found to be a non-basmati fine grain rice genotype.

REFERENCES

1. FAO, 2002. Concern About Rice Production Practices. Food and Agriculture Organization, Rome Italy.
2. Bellon, M.R., D.S. Brar, B.R. Lu and J.L. Pham, 1998. Rice Genetic Resources. In J.J. Bertinn and M. Hermadinquer, Kuel (ed). Atlas of Food Crops, pp: 73-94.
3. Maclean, J.L., D.C. Dawe, B. Hardy and G.P. Hettel, Eds, 2002. Rice Almanac. Source Book for the Most Important Economic Activity on Earth. Third edition ed. Wallingford, UK: CABI Publishing.
4. Anonymous, 2003. Concept Paper, International Year of Rice 2004-International Rice Commission Newslatte. FAO, Rome, 52: 19-27.
5. Juliano, B.O. and C.P. Villareal, 1993. "Grain quality evaluation of world rices. "International Rice research Institute Manila.
6. Khan, I.Z., A. Hussain and M. Sadiq, 2000. Role of plant growth regulators (Auxin and Cytokinin) in callus induction in rice (*Oryza sativa* L.) C.V. DM-25. Pak. J. of Biol. Sci., 1: 157-159.
7. Kato, S. and H.K. Haras, 1928. The affinity of rice varieties as shown by fertility of hybrid plants. Bull. Sci. Fac. Agric. Kyushu Univ.
8. Glazzman, J.C., 1987. Isozymes and classification of Asian rice varieties. Theor. Appl. Genet., 74: 21-30.
9. International rice genome sequencing project, 2005. The map-based sequence of rice genome. Nature, 46: 793-800.
10. Anonymous, 2007. Economic Survey of Pakistan. Govt. of Pakistan, Finance Div., Economic Advisors Wing, Islamabad, pp: 18-19.
11. Ito, S., W.F. Peterson and W.R. Grant, 1989. Rice in Asia: is it becoming an inferior good? American J. Agric. Econo., 71: 32-42.
12. Bajaj, S. and A. Mohanty, 2005. Recent advances in rice biotechnology towards genetically superior transgenic rice. J. Plant Biotechnology, 3: 275-307.
13. Nazir, M.S., 1994. Crop Production. (Ed.): E. Bashir and R. Bantel. National Book Foundation, Islamabad, pp: 252.
14. Bruns, H.A. and H.K. Abbas, 2006. ….title ?? Agron. J., 98: 100-106.
15. Shen, S., Q. Xue, S.Q. Shen and Q.Z. Xue, 1995. Analysis of heterosis in interspecific F1 Hybrids under three different sowing dates in rice. Journal of Zhejang Agriculture University, 21: 642-646.
16. Akhter, M., M. Ahmad and M. Ramzan, 2007. Effect of photoperiod sensitivity on yield and other economic traits of new strains of basmati rice (*Oryza sativa* L.). The J. Anim. Plant Sci., 17: 79-82.
17. Gangwar, K.S. and S.K. Sharma, 1997. Influence of planting dates on productivity of traditional scented rice varieties. IRRN, 22: 42.
18. Tari, D.B., H. Pirdashti, M. Nasiri, A. Gazanchian and S.S. Hoseini, 2007. Determination of Morphological Characteristics Affected by Different Agronomical Treatments in Rice (IR6874-3-2 Promising Line). Asian J. Plant Sci., 6: 61-65.
19. The Biology and Ecology of Rice (*Oryza sativa* L.) in Australia, 2005. The office of gene technology regulator. Department of Health and Ageing. Aus. Govt.
20. Akbar, N., A. Iqbal, H.Z. Khan, M.K. Hanif and M.U. Bashir, 2010. Effect of different sowing dates on the yield and yield components of direct seeded fine rice (*Oryza sativa* L.). Journal of Plant Breeding and Crop Science, 2: 312-315.