BIBLIOGRAPHY

PAGUI-EN, ROSYLLE ANN T. APRIL 2013. Growth and Yield of the Fifteen High Yielding Rice Varieties Under Tabuk City Condition. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

Fifteen high yielding rice varieties were planted and evaluated to identify the best variety based on the growth, yield, and resistance to stemborer and rice blast and to determine the profitability of growing high yielding varieties under Tabuk City condition.

The fifteen high yielding rice varieties used were NSIC Rc122, NSIC Rc138, NSIC Rc146, NSIC Rc160, NSIC Rc212, NSIC Rc214, NSIC Rc216, NSIC Rc222, NSIC Rc224, NSIC Rc226, NSIC Rc238, NSIC Rc240, PSB Rc80, PSB Rc82, and PSB Rc18 (check variety).

Based on the results of the study, the best varieties under Tabuk City condition were NSIC Rc160, NSIC Rc238 and NSIC Rc240, based on weight of 1000 filled grains, grain yield per plot, grain yield per hectare and return on cash expenses in which surpassed the yield per plot and per hectare and ROCE of the check variety PSB Rc18. The varieties were resistant to stem borer and with intermediate resistance to neck rot.

All entries are recommended for commercialization in Tabuk City based on positive ROCE while NSIC Rc160, NSIC Rc238, and NSIC Rc240 can be considered for higher profit.

INTRODUCTION

Rice is a semi- aquatic plant scientifically known as *Oryzasativa* L. It grows readily in areas of considerable warm temperature. Rice is the staple food crop of 90% of the Philippine population. It accounts for 41% of total calorie intake and 31% of total protein intake (PhilRice, 2003).

With an average annual per capita consumption of 118 kg by a population of 88 million as of year 2007, the annual production from 4 million hectares of rice lands regularly requires imports of up to 2 million tons annually. In addition, the growth in production of 1.9% is failing to keep up with increasing demand from a population growth of 2.3% per annum (Yabes, 2008). The continual increase of the country's population means that rice production must also be increased to satisfy the country's demand.

In Tabuk City, no crop is more important than rice for the basic sustenance of the local people. Many farmers are struggling to produce enough rice for more profit and to feed their families throughout the year. However, with the current problem on increasing population, theland intended for cropping is used for residential and commercial purposes. To help meet the gap, most farmers in the locality are looking for rice varieties that are early maturing and high yielding to increase their production per unit area and to gain more profit at the same time.

However, before introducing any high yielding varieties in a certain location, it must be first evaluated in order to find out its adaptability and performance to local conditions.

The study aimed to:

1. evaluate the growth and yield of the fifteen high yielding rice varieties underTabuk City condition;

2. identify the best variety in terms of yield and resistance to pest and diseases under Tabuk City condition; and

3. determine the profitability of growing high yielding rice varieties under Tabuk City condition.

The study was conducted in a farmer's field at Tabuk City from July to November 2012.

REVIEW OF LITERATURE

Varietal Evaluation

PCARRD (1981) stated that planting the right varieties that are suited to specific locations would result to increase yield by 20%.

In addition, new varieties under good condition have greater yield potentials than old ones (Vergara, 1992). The continuous development of high yielding varieties that is resistant to pest and diseases and possesses excellent grain qualities is essential to keep up with the increasing demand for rice and the changing environment (IRRI, 2009).

Results of Previous Researches on Rice HYV Production

Belino (2005) stated that under Poblacion, Kibungan, Benguet, SN-73 has the highest number of filled grains per panicle, hence, has the highest grain yield per plot and per hectare; and PSB Rc18 was the shortest in height. In addition, Cawatig (2007), stated that planting PSB Rc18 and NSIC Rc112 in Rizal, Kalinga, PSB Rc18 and NSIC Rc112 were the best performing variety since both had the highest length per panicle at harvest, number of filled grains per panicle, grain yield per plot, computed yield per hectare and return on cash expenses.

Under Manabo, Abra condition, Cayomba (2004), concluded that among the high yielding varieties tested, PSB Rc60 and PSB Rc98 could be considered to adaptable in the locality, while IR60, PSB Rc66 and PSB Rc100 are not suited or adaptable as shown by their few number of grains per panicle and low production per hectare. However, all varieties showed good performance in terms of stem borer damage and blast (neck rot). C_4-63 the best variety, gave the highest yield and it was still the best for low elevation.

In addition, NSIC Rc150 and NSIC Rc140 were the shortest plants, produced the highest productive tillers per hill, and were the highest yielders. Both varieties were also resistant to dead hearts, whiteheads, and neck rot. They also had the highest ROCE (Modesto, 2010).

According to Batani (2004) under Barangay Bilis, Burgos, La Union, PSB Rc82 was the earliest to mature while PSB Rc96 has the highest grain yield per plot and per hectare among eight variety studies. On white heads evaluation SL8 and PSB Rc96 were rated resistant. However, Siteng (2005), fund that planting SL8 in Kadayakan, Maria Aurora showed that SL8 acquired the highest grain yield for both per plot and /ha; and SL8 were also resistant to white heads.

Water and Fertilizer Management

PhilRice (2003) stated that efficient water supply is one of the most important factors in successful and sustainable rice production. Since water is continuously becoming a scarce resource it has to be properly managed. Water greatly affects the rice plant, the soil nutrients, the physical status of the soil, the insect pests and diseases, and the weed population.

The basal fertilizer application with a combined P and K level of 30-40 kg/ ha each of P 20 and K 20 helps early seedling vigor and stand establishment, rapid coverage of the field by ice foliage with consequent reduction of weed population (IRRI, 1986).

Temperature Requirement

The important factor for rice production is favorable temperature. Rice can be grown most successfully in regions that have warm temperature during the entire growing season for 4-6 months (Martin and Leonard, 1970).

Warm temperature is needed to increase the growth activities inside the seeds during the germination stage. Low temperature (10ºC) will decrease the germination of the seed. Likewise, very high temperature at 40ºC or higher decreases the germination percentage or can kill the sprouting seeds (Vergara, 1992).

Effect of Pests and Diseases

According to PhilRice (2003), rice is susceptible to a range of diseases and pests, which annually reduce 50-100 % yield of rice crops due to their damage. The most common diseases are caused by the fungi sheath blight and rice blast, and the stalk borer, leaf hopper, army worms, whorl maggot is a common insect pest (UPLB, 1983).

Harvesting and Threshing

PhilRice (2003) stated that it is important to harvest a crop on time otherwise there will be grain losses due to feeding of rats, birds, and other insects and from shattering and lodging. Both early and late harvests are detrimental to grain yield and to milling recovery.

Based on maximum grain yield with highest milling recovery and seed viability, the best time to harvest transplanted rice is between 30-42 days after heading during the wet season and between 28-34 days after heading during the dry season.

As much as possible, the harvested rice should be threshed immediately. Threshing can be done manually or mechanically (PhilRice, 2003). Moreover, harvesting and its related handling operations are significant points in post production sequence where losses can be incurred (PCARRD, 2001).

MATERIALS AND METHOD

Fifteen high yielding rice varieties were used in the study as treatments. All of the varieties were taken at the Department of Agriculture, Tabuk City.

The varieties serves as treatments as follows:

Code	Variety	Yield (PhilRice, 2012)	
		Average Yield (t/ha)	Maximum Yield (t/ha)
T_{10}	NSIC Rc122 (Angelica)	4.7	8.9
T_7	NSIC Rc138 (Tubigan 5)	5.4	8.0
T_{12}	NSIC Rc146 (PJ7)	4.6	6.9
T_6	NSIC Rc160 (Tubigan 14)	5.6	8.2
T_8	NSIC Rc212 (Tubigan 15)	6.0	10.0
T_3	NSIC Rc214 (Tubigan 16)	6.0	10.2
T_9	NSIC Rc216 (Tubigan 17)	6.0	9.7
T_1	NSIC Rc222 (Tubigan 18)	6.1	10.0
T_4	NSIC Rc224 (Tubigan 19)	5.8	9.1
T_{11}	NSIC Rc226 (Tubigan 20)	6.2	9.8
T_5	NSIC Rc238 (Tubigan21)	6.4	10.6
T_2	NSIC Rc240 (Tubigan22)	6.4	10.6
T_{13}	PSB Rc80 (Pasig)	5.0	8.7
T_{14}	PSB Rc82 (Peñaranda)	5.4	12.0
T_{15}(check)	PSB Rc18 (Ala)	5.1	8.1

Seed pre-germination and Seedbed preparation

The seeds were soaked in clean or running water for 12-24 hours. It was incubated at 30ºC for 24-36 hours (or until a white dot appears which isthe emerging roots). The seeds were aerated during the incubation.

Fifteen seedbeds were prepared for the fifteen high yielding rice varieties. Each variety was separately sown in a 1m x 1m seedbed to avoid mixture of the different varieties and proper labels were placed for easy identification (Fig. 1).

Land Preparation and Experimental Design

An experimental area of 540 $m^2$was prepared for the fifteen high yielding rice varieties which was replicated three times and divided into 45 plots with a measurement of 2m x 6m each. It was puddled and leveled for easy transplanting.

Lay-outing and Transplanting

The experimental plot was laid-out following the Randomized Complete Block Design (RCBD) with three replications.

The fifteen varieties were transplanted 21 days after sowing (DAS). The planting densities were two seedlings per hill at distances of 20 cm × 20 cm (Fig.2). Irrigation was done right after transplanting with 2-5 cm water depth.

All other recommended cultural management practices such as fertilizer application, weeding, and insect and disease management were done equally to all treatments.

Data gathered were:

A. Agroclimatic Data. The temperature, relative humidity, amount of rainfall and sunshine duration during the study was taken from the Municipal Agriculturist office of Tabuk City.

B. Agronomic Characteristics

1. Plant survival (%). This was taken one week after transplanting and computed using this formula:

$$\% \text{ plant survival} = \frac{\# \text{ of surviving plants}}{\text{total } \# \text{ of plants planted}} \times 100$$

2. Height of seedlings seven days after transplanting (cm). The height of seedlings per variety were measured from the base to the tip of the longest leaf using ten sample hills per plot, one week after transplanting.

3. Number of days from transplanting to tillering. This was taken when 50% of the total plants in a plot started producing tillers.

4. Number of productive tillers per hill. The number of productive tillers was counted using ten sample hills selected at random. Only rice plants that produce panicles was counted and considered.

5. Number of days from transplanting to heading. This was taken when at least 50% of the total plants produced panicles per treatments.

6. Number of days from transplanting to ripening. This was taken when 80% of the grains in the panicle have turned yellow.

7.Length of panicle at harvest (cm). This was measured from the panicle tip excluding the awn using ten sample plants per plot taken at random.

8.Final height at harvest (cm). This was measured from the soil surface to the tip of the longest panicle using ten sample plants per plot.

C.Pest and Disease Incidence

1.Insect pest evaluation (Stem Borer). Field rating of rice stem borers was based on the actual percentage of dead hearts and white heads. Dead hearts was counted 45 days after transplanting (DAT) while white heads, ten days before harvesting (DBH). The following standard rating scale was used (PhilRice, 1996) :

Scale	% Dead Hearts	%White Heads	Remarks
1	1-10	1-5	Resistant
3	11-20	6-10	ModeratelyResistant
5	21-30	11-15	Intermediate
7	31-60	16-25	Moderately Susceptible
9	60 & above	25 & above	Susceptible

2.Blast disease evaluation (Neck Rot). Evaluation of the severity of the rice blast (neck rot) was taken from the plants at the center rows; ten hills taken at random were used. The following standard rating scale was used (PhilRice, 1996):

$$\% \text{ Infection} = \frac{\# \text{ of panicles infection}}{\text{total } \# \text{ of panicle}} \times 100$$

Index	% Blast Infection	Rating
1	0-5 affected by blast	Resistant
2	6-25 affected by blast	Intermediate
3	25 & above affected by blast	Susceptible

D.Yield and Yield Components

1.Number of filled and unfilled grains per panicle.This was recorded by counting the number of filled and unfilled grains at ripening using ten sample panicles per plot.

2.Weight of 1000 filled grains (g). One thousand seeds were selected at random after drying at 14% moisture content then weighed.

3.Grain yield per plot (kg). The grains were dried to approximately 14% moisture content after harvest. The filled grains were separated from the unfilled grains by winnowing. Only the filled grains were used to obtain the grain weight or yield per plot.

4.Grain yield per hectare (tons/ha). This was taken by converting the yield per plot into tons per hectare by using the formula below:

Yield per plot x 0.83 = __________

5.Return on Cash Expenses (ROCE). This will be obtained by using this formula:

$$ROCE = \frac{\text{Net Income}}{\text{Total Expenses}} \times 100$$

Data Analysis

All quantitative data were analyzed using the Analysis of Variance (ANOVA) for Randomized Complete Block Design (RCBD) with three replications. The significant differences among treatment means were tested using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Agroclimatic Data

Shown in Table 1 was the monthly agroclimatic information during the conduct of the study. The highest maximum temperature was recorded during the month of July and September and the lowest minimum temperature was during the month of November .The relative humidity ranged from 76% to 82%. The recorded temperature and relative humidity is within the favorable range of growing rice. The highest recorded amount of rainfall is 235.50 mm during the month of July and the lowest was during the month of November. Generally, the sunshine duration were recorded during the conduct of the study is not enough due to cloud shading.

Table 1. Monthly agroclimatic data during the conduct of the study

MONTH	TEMPERATURE (°C)		RELATIVE HUMIDITY (%)	AMOUNT OF RAINFALL (mm)	SUNSHINE DURATION (min)
	Minimum /	Maximum			
July	24.00	33.00	78	235.50	146.30
August	23.60	32.70	77	226.10	170.80
September	24.70	33.00	76	117.60	354.10
October	22.40	30.40	81	138.30	337.40
November	21.90	30.20	82	96.80	184.60

Plant Survival

There were no significant differences on the plant survival of the different high yielding varieties as shown in Table 2. NSIC Rc212, PSB Rc18, PSB Rc80 and PSB Rc82 obtained the highest plant survival with a mean of 99%. The lowest plant survival of 95% was noted on NSIC Rc146and NSIC Rc222 due to the damage caused by rodents feeding on the plants.

Height of Seedlingsat 7 DAT

Table 2 shows the significant differences on the height of seedlings of the fifteen high yielding varieties at 7 DAT. PSB Rc80 obtained the tallest seedling height, but it was comparable to NSIC Rc122, NSIC Rc160, NSIC Rc212, NSIC Rc214, NSIC Rc216, NSIC Rc222, and PSB Rc18. The shortest among the varieties evaluated were NSIC Rc138, NSIC Rc146, NSIC Rc238, and PSB Rc82 with a mean of 21.73cm, 21.83cm, 21.69cm and 21.83cm, respectively.

Final Height at Harvest

Significant differences were observed among varieties on the final height at harvest (Table 2). The tallest variety at 7 DAT was not the tallest at harvest. NSIC Rc240 was the tallest among the varieties with a mean of 110.70 cm followed by NSIC Rc238 and NSIC Rc222. Still, the shortest among the varieties were NSIC Rc138 and NSIC Rc146 with a mean of 92.54 cm and 92.11 cm, respectively. This difference could be attributed to their varietal variability.

Table 2. Plant survival, height of seedlings 7 DAT and final height at harvest of the fifteen high yielding rice varieties

VARIETY	PLANT SURVIVAL (%)	HEIGHT OF SEEDLINGS (cm)	FINAL HEIGHT AT HARVEST (cm)
NSIC Rc122	98	22.37[abcd]	100.90[cd]
NSIC Rc138	98	21.73[d]	92.54[i]
NSIC Rc146	95	21.83[d]	92.11[i]
NSIC Rc160	98	22.35[abcd]	97.81[ef]
NSIC Rc212	99	22.51[abcd]	96.85[fg]
NSIC Rc214	96	23.17[abc]	99.41[de]
NSIC Rc216	98	23.27[ab]	97.28[f]
NSIC Rc222	95	23.17[abc]	102.29[c]
NSIC Rc224	96	22.26[bcd]	98.00[ef]
NSIC Rc226	98	22.18[cd]	95.32[gh]
NSIC Rc238	98	21.69[d]	105.66[b]
NSIC Rc240	96	22.17[cd]	110.70[a]
PSB Rc80	99	23.35[a]	94.81[h]
PSB Rc82	99	21.83[d]	98.17[ef]
PSB Rc18 (check)	99	22.55[abcd]	94.94[gh]
C.V (%)	ns	2.41	1.13

Means with the same letter are not significantly different at 0.05 level by DMRT.

Number of Days from Transplanting toTillering

Shown in Table 3 is the number of days from transplanting to tillering. Significant differences among the treatments were noted. NSIC Rc146, NSIC Rc160, and PSB Rc82 were the earliest to produce tillers with a mean of 7 days followed by NSIC Rc138, NSIC Rc216, NSIC Rc224, NSIC Rc226 and NSIC Rc238. NSIC Rc212, and check variety PSB Rc18 were noted to be the latest to tiller. Vergara (1992), stated that plants produce more tillers during wet season than in dry season. In addition, tillering of improved varieties would vary according to the ecological conditions in which these are grown (UPLB, 1982).

Number of Days from Transplanting to Heading

The number of days from transplanting to heading is shown in Table 3. Numerically, NSIC Rc238 was the earliest to produced head with a mean of 57 days followed by NSIC Rc160 (59 days). The latest to produced heads was the check variety PSB Rc18 with a mean of 70 days. Moreover, early maturing varieties have lesser exposure to environmental stresses which gradually affect the yield of the plant.

Number of Days from Transplanting to Ripening

Number of days from transplanting to ripening is presented in Table 3. It was observed that NSIC Rc238 was the earliest to ripen at 84 days after transplanting followed by NSIC Rc160 with a mean of 85 days. The latest to ripen was PSB Rc18 with a mean of 100 days after transplanting (Fig.3). According to Siteng (2005), different varieties differ in their performances and adaptability to a certain location.

Table 3. Number of days from transplanting to tillering, heading, and ripening of the fifteen high yielding rice varieties

VARIETY	NUMBER OF DAYS FROM TRANSPLANTING TO:		
	TILLERING	HEADING	RIPENING
NSIC Rc122	9	68	96
NSIC Rc138	8	60	88
NSIC Rc146	7	64	92
NSIC Rc160	7	59	85
NSIC Rc212	10	63	93
NSIC Rc214	9	67	95
NSIC Rc216	8	66	93
NSIC Rc222	9	67	94
NSIC Rc224	8	63	90
NSIC Rc226	8	63	89
NSIC Rc238	8	57	84
NSIC Rc240	9	64	92
PSB Rc80	9	60	90
PSB Rc82	7	66	92
PSB Rc18(check)	10	70	100
C.V (%)	ns	ns	ns

Means with the same letter are not significantly different at 0.05 level by DMRT.

Length of Panicle at Harvest

The length of panicle at harvest is shown in Table 4. It was noted that NSIC Rc214 significantly had the longest length of panicle with a mean of 25.53 cm but comparable to the panicle length of NSIC Rc212 (25.29 cm), NSIC Rc240 (24.83 cm), NSIC Rc238 (24.25 cm) NSIC Rc224 (23.73 cm) and NSIC Rc146 (23.58 cm). It could mean that the longer the panicles could translate to more grains per panicle.

Number of Productive Tillers Per Hill

Table 4 shows the number of productive tillers per hill. It was observed that NSIC Rc240 and check variety PSB Rc18 had significantly produced the greatest number of productive tillers with a mean of 14 but comparable to the 13 productive tillers of NSICRc214 and NSIC Rc216. NSIC Rc138, NSIC Rc146, NSIC Rc212, NSIC Rc224, NSIC Rc226, and PSB Rc80 produced the lowest number of productive tillers per hill.

Table 4. Length of panicle number of productive tillers per hill of the fifteen high yielding rice varieties

VARIETY	LENGTH OF PANICLE (cm)	NUMBER OF PRODUCTIVE TILLERS PER HILL
NSIC Rc122	22.15^{def}	11^{cd}
NSIC Rc138	22.98^{cde}	10^{d}
NSIC Rc146	23.58^{abcd}	10^{d}
NSIC Rc160	21.90^{def}	11^{cd}
NSIC Rc212	25.29^{ab}	10^{d}
NSIC Rc214	25.53^{a}	13^{ab}
NSIC Rc216	22.84^{cde}	13^{ab}
NSIC Rc222	23.29^{bcde}	12^{bc}
NSIC Rc224	23.73^{abcd}	10^{d}
NSIC Rc226	23.40^{bcde}	10^{d}
NSIC Rc238	24.25^{abc}	12^{bc}
NSIC Rc240	24.83^{abc}	14^{a}
PSB Rc80	21.45^{ef}	10^{d}
PSB Rc82	22.01^{def}	11^{cd}
PSB Rc18 (check)	21.82^{def}	14^{a}
C.V (%)	4.28	7.41

Means with the same letter are not significantly different at 0.05 level by DMRT.

More productive tillers mean higher yield potential.

Number of Filled and Unfilled GrainsPer Panicle

Shown in Table 5 is the number of filled and unfilled grains per panicle. It was recorded that NSIC Rc214 is significantly had the highest number of filled grains with a mean of 156 but comparable to check variety PSB Rc18 with a mean of 153. NSIC Rc122 produced the lowest number of filled grains with a mean of 104. There were no significant differences observed on the number of unfilled grains per panicle. NSIC Rc122 and NSIC Rc224 had the highest number of unfilled grains with a mean of 30 while NSIC Rc212 produced the lowest number of unfilled grains with a mean of 19.

Table 5. Number of filled and unfilled grains per panicle of the fifteen high yielding rice varieties

VARIETY	NUMBER OF:	
	FILLED GRAINS	UNFILLED GRAINS
NSIC Rc122	104^{f}	30
NSIC Rc138	137^{c}	24
NSIC Rc146	127^{cd}	22
NSIC Rc160	119^{def}	26
NSIC Rc212	137^{c}	19
NSIC Rc214	156^{a}	23
NSIC Rc216	129^{cd}	26
NSIC Rc222	124^{cde}	27
NSIC Rc224	127^{cd}	30
NSIC Rc226	109^{ef}	26
NSIC Rc238	126^{cd}	28
NSIC Rc240	130^{cd}	26
PSB Rc80	137^{bc}	22
PSB Rc82	124^{cde}	24
PSB Rc18 (check)	153^{ab}	23
C.V (%)	7.02	22.14

Means with the same letter are not significantly different at 0.05 level by DMRT.

Weight of 1,000 Filled Grains

There were significant differences on the weight of 1,000 filled grains as shown in Table 6. Among the varieties, it was noted that NSIC Rc240 obtained the heaviest weight with a mean of 30.40g but comparable to the 1000 filled grains weight of PSB Rc18 (29.56g), NSIC Rc238 (29.26g), NSIC Rc226 (28.93g). The weight of 1,000 filled grains of NSIC Rc138 (25.46g), NSIC Rc212 (25.93g), and PSB Rc80 (25.23g) are not significant with each other, which obtained the lightest weight. Significant differences could be due to grain characteristics such as the size of grains.

Grain Yield Per Plot
andPer Hectare

Grain yield per $12m^2$and per hectare is shown in Table 6. Statistical analysis showed that NSIC Rc240 significantly produced the highest yield per $12m^2$ and per hectare, but comparable to most of the varieties. NSIC Rc122 and PSB Rc80 obtained the lowest yield per $12m^2$ and per hectare. In addition, NSIC Rc160, NSIC Rc238 and NSIC Rc240 surpassed the yield of check variety PSB Rc18.

Moreover, the yield of NSIC Rc146, NSIC Rc160 and check variety PSB Rc18 were higher than the national average yield stated by Philrice. Yield is normally a function of genetic make-up and environmental conditions (Modesto, 2010).

Table 6. Weight of 1000 filled grains; yield per plot and per hectare of the fifteen high yielding rice varieties

VARIETY	WEIGHT OF 1000 FILLED GRAINS (g)	YIELD PER PLOT ($kg/12m^2$)	YIELD PER HECTARE (tons/ha)
NSIC Rc122	26.56[de]	5.00[d]	4.14[d]
NSIC Rc138	25.46[e]	6.33[abc]	5.25[abc]
NSIC Rc146	26.06[de]	6.73[abc]	5.58[abc]
NSIC Rc160	27.60[cd]	7.16[ab]	5.94[ab]
NSIC Rc212	25.93[e]	5.83[cd]	4.83[cd]
NSIC Rc214	26.60[de]	6.43[abc]	5.33[abc]
NSIC Rc216	26.13[de]	6.10[bc]	5.06[bc]
NSIC Rc222	28.13[bc]	6.20[abc]	5.14[abc]
NSIC Rc224	26.33[de]	6.94[ab]	5.76[ab]
NSIC Rc226	28.93[abc]	5.73[cd]	4.75[cd]
NSIC Rc238	29.26[ab]	7.13[ab]	5.91[ab]
NSIC Rc240	30.40[a]	7.26[a]	6.03[a]
PSB Rc80	25.23[e]	4.96[d]	4.11[d]
PSB Rc82	26.26[de]	6.36[abc]	5.28[abc]
PSB Rc18 (check)	29.56[ab]	6.96[ab]	5.78[ab]
C.V (%)	3.19	8.92	8.95

Means with the same letter are not significantly different at 0.05 level by DMRT.

Return on Cash Expense (ROCE %)

Table 7 shows that all of the varieties had positive return on cash expenses. NSIC Rc240 obtained the highest return on cash expenses of 132.69%, but comparable to NSIC Rc160, NSIC Rc238, NSIC RC138, NSIC Rc146, NSIC Rc214, NSIC Rc222, PSB Rc82 and PSB Rc18, respectively. High ROCE could be attributed to higher yield.

Table 7. Return on cash expenses of the fifteen high yielding rice varieties

Note: the selling price of rice grains is based on Php 30.00 per kilo.

VARIETY	GRAIN YIELD ($kg/12m^2$)	GROSS INCOME (Php)	TOTAL EXPENSES (Php)	NET INCOME (Php)	ROCE (%)
NSIC Rc122	5.00	150.00	93.60	56.40	60.25
NSIC Rc138	6.33	189.90	93.60	96.30	102.88
NSIC Rc146	6.73	201.90	93.60	108.30	115.70
NSIC Rc160	7.16	214.80	93.60	121.20	129.48
NSIC Rc212	5.83	174.90	93.60	81.30	86.85
NSIC Rc214	6.43	192.90	93.60	99.30	106.08
NSIC Rc216	6.10	183.00	93.60	89.40	95.51
NSIC Rc222	6.20	186.00	93.60	92.40	98.71
NSIC Rc224	6.94	208.20	93.60	114.60	122.43
NSIC Rc226	5.73	171.90	93.60	78.30	83.65
NSIC Rc238	7.13	213.90	93.60	120.30	128.52
NSIC Rc240	7.26	217.80	93.60	124.20	132.69
PSB Rc80	4.96	148.80	93.60	55.20	58.97
PSB Rc82	6.36	190.80	93.60	97.20	103.84
PSB Rc18 (check)	6.96	208.80	93.60	115.20	123.07

Insect Pest (Stem Borer) and Disease
(Neck Rot) Evaluation

Shown in Table 8 is the evaluation of Stem borer. Evaluation of stem borer expressed as dead hearts and whiteheads.Observations were done at 45 DAT and 10 days before harvesting. All varieties were resistant to dead hearts and whiteheads.

Rice blast evaluation was taken before harvest. NSIC Rc138, NSIC Rc146, NSIC Rc216, NSIC Rc226 and NSIC Rc238 were susceptible, and the rest of the varieties wereintermediately resistant to neck rot. Varieties differ in reactions to different diseases (Vergara, 1992).

Table 8. Evaluation of stem borer (as whiteheads and dead hearts), and neck rot

VARIETY	WHITE HEADS	DEAD HEARTS	NECK ROT
NSIC Rc122	Resistant	Resistant	Intermediate
NSIC Rc138	Resistant	Resistant	Susceptible
NSIC Rc146	Resistant	Resistant	Susceptible
NSIC Rc160	Resistant	Resistant	Intermediate
NSIC Rc212	Resistant	Resistant	Intermediate
NSIC Rc214	Resistant	Resistant	Intermediate
NSIC Rc216	Resistant	Resistant	Susceptible
NSIC Rc222	Resistant	Resistant	Intermediate
NSIC Rc224	Resistant	Resistant	Intermediate
NSIC Rc226	Resistant	Resistant	Susceptible
NSIC Rc238	Resistant	Resistant	Susceptible
NSIC Rc240	Resistant	Resistant	Intermediate
PSB Rc80	Resistant	Resistant	Intermediate
PSB Rc82	Resistant	Resistant	Intermediate
PSB Rc18 (check)	Resistant	Resistant	Intermediate

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

Fifteen varieties of rice were planted and evaluated in Tabuk City condition from July to November 2012. The varieties evaluated were: NSIC Rc122, NSIC Rc138, NSIC Rc146, NSIC Rc160, NSIC Rc212, NSIC Rc214, NSIC Rc216, NSIC Rc222, NSIC Rc224, NSIC Rc226, NSIC Rc238, NSIC Rc240, PSB Rc80, PSB Rc82, and PSB Rc18 (check variety).

The study was conducted to evaluate the growth and yield of the fifteen high yielding rice varieties; identify the best variety in terms of yield and resistance to pest and diseases; and determine the profitability of growing high yielding rice varieties under Tabuk City condition.

Highly significant differences were observed on the height of seedlings, number of days from transplanting to tillering, to heading, to ripening, number of productive tillers, length of panicle, final height, and number of filled grains, weight of 1000 filled grains, yield per $12m^2$, and yield per hectare.

NSIC Rc238 was the earliest to mature at 84 days after transplanting while the latest to mature was PSB Rc18 (check variety) with a mean of 100 days.

NSIC Rc240 was the tallest followed by NSIC Rc238 and NSIC Rc222, while NSIC Rc138 and NSIC Rc146 were the shortest. NSIC Rc214 obtained the longest panicle at harvest, followed by NSIC Rc212, NSIC Rc240, and NSIC Rc238, respectively. NSIC Rc160 and PSB Rc18 (check variety) had the shortest panicle.

NSIC Rc240 and PSB Rc18 (check variety) produced the highest number of productive tillers while NSIC Rc138, NSIC Rc212, NSIC Rc222, NSIC Rc146, and PSB

Rc80 produced the lowest number of productive tillers per hill. NSIC Rc214 produced the highest number of filled grains followed by PSB Rc18 (check variety), while NSIC Rc212 produced the lowest number of unfilled grains per panicle.

All varieties were found resistant to stem borer. On blast (neck rot) evaluation, NSIC Rc138, NSIC Rc146, NSIC Rc216, NSIC Rc226, and NSIC Rc238 were susceptible, the rest of the varieties were intermediately resistant to neck rot.

NSIC Rc240 obtained the heaviest weight of 1000 filled grains, grain yield per plot and per hectare, and also highest return on cash expenses followed by NSIC Rc160 and NSIC Rc238.

Conclusion

Based on the results of the study, the best varieties under Tabuk City condition were NSIC Rc160, NSIC Rc238 and NSIC Rc240, based on weight of 1000 filled grains, grain yield per plot, grain yield per hectare and return on cash expenses in which surpassed the yield per plot and per hectare and ROCE of the check variety PSB Rc18. The varieties are resistant to stem borer and with intermediate resistant to neck rot.

Recommendation

All entries are recommended for commercialization in Tabuk City based on positive ROCE while NSIC Rc160, NSIC Rc238, and NSIC Rc240 can be considered for higher profit.

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