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Field Performance and Economic Analysis of Different Adlai (Coixlacryma-Jobi L.) Cultivars Grown Under Lowland Conditions in Cebu City, Philippines Marciano D. Tangpos^{1*}

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ABSTRACT

Adlai (*Coixlacryma – jobi* L.) had a higher potential alternative crop for rice and corn, but information about this crop is still limited. This study was conducted to; a) evaluate the agronomic component, yield, and yield characteristics; and b) determine the economic analysis of different Adlai cultivars under lowland conditions of Carcar City, Cebu. The area (360 m2) was laid out in Randomized Complete Block Design (RCBD). Three Adlai cultivars were designated as treatments replicated thrice. All treatments were applied uniformly with inorganic fertilizer at the rate of 120-60-60 kg/ha N, P2O5, and K2O using complete fertilizer (14-14-14) and urea (46-0-0). Among cultivars, Tapol and Gulian markedly headed and matured earlier than Ginampay. Tapol cultivar grew taller and produced longer panicles with extended and broader leaves. Meanwhile, Gulian had a higher number of panicles than Tapol and Ginampay. In terms of yield, Tapol cultivar produced a higher grain yield comparable to Gulian and Ginampay. However, only the Tapol cultivar generated the highest gross margin and percent return on investment of PHP 59, 269.79 and 3.51 which indicated as high adaptability of Tapol cultivar under lowland conditions in Carcar City, Cebu.

INTRODUCTION

Nature and Importance of the study

The Philippine government still facing the dilemma regarding food sustainability. Production of domestic foods cannot suffice the Filipino populace (Simeon, 2019). In turn, effort must be made to attain the issues on food security. Hereafter, a locally known Adlai (*Coixlacryma – jobi* L.), otherwise known as Chinese pearl barley or Job's Tear (Simeon, 2019) from the Poaceae family (Gaitan and Gaitan, 2017) reported as a staple food for Southern Zamboanga del Sur in the Subanen tribe (Gloria et al., 2015). It was chemically analyzed to have higher amount of starch, vitamins, and minerals that can lower blood pressure, anticancer, and reduce inflammation (Gaitan and Gaitan, 2017.

Though it has had higher potential, information about this crop is still limited (Gaitan and Gaitan, 2017). Information on the morphology, yield and economic return limit only in Mindanao region. Recently, there have been known cultivars that the isolated part of Mindanao has used as their staple food (Gaitan and Gaitan, 2017) including tapol, gulian and ginampay. Characteristically, tapol is dull and darker in color, yielding more than 4.50 tons per hectare.

Ginampay has white grain color and has a yield of more than 4.78 tons per hectare, while Gulian has light, darker grains and yields 4.80 mt/ha (Dela Cruz, 2011), respectively. However, yield varies when planted in different topography. Gloria et al. (2015) found out that yield of this cultivar was minimally obtained at about 3.5 tons per hectare in other regions. Meanwhile, to give detailed on this cultivars, a varietal trial was conducted to document its morphology, yield components and economic returns.

MATERIALS AND METHODS

Experimental Area, Design and Field Layout

The experiment was conducted at Brgy. Pob. III, Carcar City, Cebu, approximately 2 kilometers away from the town proper of Carcar. Geographically, the area was situated at 10.115111 latitudes and 123.639954 longitudes and characterized as a flat gradient and dominated by grasses and vegetations therein.

The area (255 m2) was arranged in a randomized complete block design (RCBD) with three treatments replicated thrice. Different cultivars were designated as treatments (T1 (Ginampay), T2 (Gulian), and T3 (Tapol)). To facilitate data gathering, replications per treatment plot were separated by 1.5 m and 1 m alleyways. Each plot measured 4 m x 5 m with six rows per plot and ten hills per linear row.

Crop establishment

Adlai seeds were planted in the furrows with a distance of 90 cm between rows and 60 cm between hills at 2 seeds per hill. One (1) week after germination, thinning at one plant per hill was done while thinned plants were transferred to missing hills to complete the desired plants per plot. Fertilization was done using commercial fertilizer as Complete (14-14-14, N-P2O5-K2O) and Urea (46-0-0, N-P2O5-K2O).

Half of the recommended rate (120-60-60) (NP2O5K2O) using complete fertilizer was applied two weeks after emergence, while the remaining half of recommended fertilizer was applied 45 days after planting. First manual weeding was employed three (3) weeks after planting, while second weeding was done 40 days after planting. Integrated Pest Management (IPM) was adopted in the study.

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Harvesting and Processing

Harvesting was done separately to all firmed grains and whitish color for Gulian and Guinampay and pale red for Tapol cultivar. Harvested adlai crops were threshed using the locally made threshing bed called "hampasan" or "lambos". Grains were then sundried to 14% moisture content and winnowed before gathering all the necessary data.

Data Gathered

Gathered data was limited on the agronomic characteristics, yield, and yield components, and gross margin analysis. It includes the number of days from planting to heading, number of days from planting to maturity, plant height at maturity (cm), Leaf Area Index (LAI), number of productive tillers per hill at maturity, number of panicle per tiller per hill, number of spikelet per panicles, the weight of 1,000 grains (g), grain yield, dry matter yield, and net income return.

Statistical Analysis

Data was summarized, tabulated, and statistically analyzed using the Analysis of Variance (ANOVA). Differences

between treatment means were further investigated using the Honestly Significant Difference (HSD) Test at a 5 % alpha level.

RESULTS AND DISCUSSION

Agronomic Characteristics

Statistically, Adlai cultivars differed significantly regarding heading time, maturity, plant height, and Leaf Area Index (LAI). Among the three cultivars, Tapol is significantly headed (88 DAS) and matured earlier (141.67), increased plant height (255 cm), and has longer and broader leaves (1.57). However, Guinampay and Gulian are significantly comparable regarding heading, maturity time, and heights. In other regions, agronomic characteristics differed from the result of the study. In Luzon areas particularly in Cordillera valley, ginampay, gulian, and tapol matured at 158- 160 DAP while grows up to 215 to 225 cm tall (Bulong et al., 2015). In Mindanao regions particularly in Tangub City, gulian and ginampay matured at 162 DAP and grew up to 256 cm tall.

The study showed that different cultivars of Adlai showed different agronomic characteristics when planted in different areas.

 Table 1: Agronomic characteristics of different Adlai (Coixlacryma-jobi L.) cultivars grown in lowland condition in Carcar City, Cebu, Philippines

Treatments	No. of days from planting		Plant Height	LAI
	To Heading	To Maturity		
T1- Ginampay	90.67 a	146.67 a	198.67 b	1.30b
T2- Gulian	90.00a	143.37 ab	214.67 b	1.13 c
T3- Tapol	88.00b	141.67 b	255.00a	1.57 a
(Pr value)	0.0178	0.0302	0.0068	0.002
C. V. (%)	0.7444	0.9821	4.7800	4.330

Means with the same letters are not significantly different at 5 % level using HSD Test

A variation in its agronomic characteristics were mainly due to the variability of biotic and abiotic factors (Gould & Higgs, 2009; Jobbágy & Jackson, 2004). Also, crop performance may directly influence on the presence of crop stresses. According to Alizadeh et al. (2014), limited or absence of rain or soil water deficiency is the primary stress factor that can affect the growth and development of plants. In addition, Prasad et al. (2006) stated that limited soil moisture, stresses plants which hinder its development. Meanwhile, the result of this study implied that under Carcar City, Cebu, the Tapol cultivar outstands the other cultivars. It matures earlier, stands taller and with broader and longer leaves, respectively.

Yield and Yield Components

Results showed that the Tapol cultivar significantly produced more number of tillers (10.33), panicles (52.67), a higher number of spikelets (347.67), heavier 1000 weight grains (86.33 g), higher grain yield (1.52 t/ha), and heavier dried matter yield (657 kg/ha). This significant result is attributed to its genetic, environment, and interaction effects (DiLalla et al., 2009). The yield

components of these cultivars also vary from region to region. In the Mindanao regions, the Tapol cultivar also had a higher grain yield (3.07 tons/ha), while other cultivars yield varies from 1.67 to 1.85 tons/ha (Gloria et al., 2015). However, in the Luzon regions, the tapol cultivar showed the lowest yield at 0.59 tons/ha, while ginampay and gulian had higher yields of 0.64 to 0.78 tons/ha, respectively.

This shows a wide variation of its yield performance when grown in different regions. Such yield variation may be because of its existing biotic and abiotic factors (Clavijo, 2016), which also differ from region to region (Christensen et al., 2013; Doblas-Reyes et al., 2013; Parmesan and Hanley, 2015; Anderson and Song, 2020).

However, the result implied that Tapol performed best than the other two Adlai cultivars under lowland conditions in Carcar City, Cebu.

The performance of this cultivar shows higher tiller productivity and panicles per hill, more spikelets, and heavier grain weight per hectare. But, this field information need further investigation under several conditions in the location mentioned above.



Treatment	Productive Tillers	No.of Panicles	No.of Spikelets	1000 grains(g)	Grain Yield(t/ha)
T1Ginampay	8.00b	35.67c	256.00c	76.67b	0.1455 b
T2- Gulian	6.00c	53.00a	259.33b	73.67c	0.1472 b
T3- Tapol	10.33 a	52.67ab	347.67a	86.33a	1.5265a
(Pr value)	0.009	0.045	0.032	0.021	0. 042
C. V. (%)	10.87	40.13	42.60	15.73	17.14

 Table 2: Yield and Yield components of different Adlai (Coixlacryma-jobi L.) varieties grown in lowland condition in Carcar City, Cebu, Philippines

Means followed by the same letters are not significantly different at 5 % alpha level using HSD test

Economic Analysis

Table 3 shows the gross margin analysis of different Adlai cultivars grown under lowland conditions in Carcar City, Cebu. Computation of income and cost was based on the actual yield times the current buying price and the cost incurred throughout each cultivars production. Tapol cultivar gave the highest gross margin income of PhP 59,269.79 per hectare, followed by Gulian and Ginampay with a positive gross margin of PHP 4,878.79 and PHP 5,128.29. Further, the tapol cultivar also had the highest return on investment (3.51), which means that investment in the tapol cultivar could gain threefold more of its cost of production. Therefore, under Carcar City conditions, planting of Adlai (tapol) cultivar could have positive higher economic returns as evident to have increased gross income and return on investment

 Table 3: Gross margin analysis of different Adlai (Coixlacryma-jobi L.) varieties grown under lowland condition in Carcar City, Cebu

Treatment	Grain Yield	Gross Income	Total Variable	Gross Margin	Return on
			Cost		Investment (%)
	(tha-1)	(PhPha-1)	(PhPha-1)		
T1-Ginampay	0.4365	21,781.35	16,902.56	4,878.79	0.29
T2-Gulian	0.4415	22,030.85	16,902.56	5,128.29	0.30
T3-Tapol	1.5265	76,172.35	16,902.56	59,269.79	3.51

*Calculation of gross income is based on the current price of Adlai at PhP 499/kg

CONCLUSION AND RECOMMENDATION

Based on the results, the Tapol cultivar outstand agronomic characteristics, higher yield and yield components, and higher return on investment. Meanwhile, tapol cultivar was highly recommended under Carcar City conditions. Further study is recommended focusing on the performance of this cultivars relating to food and feed production, formulation, and its socio-economic analysis in national and international level.

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