ADAPTABILITY TRIAL OF FIVE (5) VARIETES OF ADLAI (*Coix lacryma, Jobi L.*) GROWN IN MARGINAL LAND, UNDER SAN MIGUEL ENVIRONMENT CONDITION, SURIGAO DEL SUR, MINDANAO, PHILIPPINES

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Abstract

The study evaluated the adaptation capacity of the five varieties of adlai (Coix lacryma-jobi L.) grown in marginal land with adverse environmental conditions through the assessment of crop morphological structures. Based on evaluations of the agronomic traits in two definitive growing stages of the plant, Tapol and Kiboa had developed better vegetative and reproductive structures. Tapol was the topmost high yielding variety followed by Kiboa, Gulian, Ginampay and unknown variety with approximately 3.07 ton/ha, 2.31 tons/ha, 1.85 ton/ha, 1.65 ton/ha and 0.98 ton/ha respectively. Tapol variety has highest number of grains produced per stem with 322 grains and then Kiboa with 205 grains. Kiboa and Tapol were the tallest varieties reaching to a total plant height of 159.6 cm and 152.5 cm respectively. They also have the longest and widest leaves. Kiboa has leaf with 76.5cm long and width of 4.5cm while Tapol has leaf of 73.2cm long and width of 4.4cm. All the varieties are pests and diseases resistance wherein the degree of infestation and infection are below Economic Threshold Level (ETL). Generally, based on the overall performance of the five varieties of adlai, Tapol and Kiboa are the best adaptive to the local environmental condition of the area.

Keywords: Adlai, Tapol, Kiboa, Gulian, Ginampay, Unknown Variety, Morphological structures, Grain yield, adaptation capacity

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1.0 Introduction

Adaptability trial is a crucial activity before any crop will be adopted for mass production especially if planted in low quality or in marginal land. Successful crop production largely depends on how well a particular cultivar or variety performs in a new set of environment within a certain geographical location. The current environmental condition, which is vital for plant performance, has been greatly altered by the impact of climate change phenomenon. The agricultural sector, for the purpose of food security and sufficiency, has kept on breeding, developing and producing crops that are best adaptive and resilient to a wide range of environmental adversities. One of the crops the Department of Agriculture had been introduced is Adlai or Job's tears (Coix lacryma – jobi L.). Taking into account the crop novelty in the area, it is therefore necessary to investigate the crop field performance that may serves later on as guide to local farmers. As part of initiatives in adlai social acceptance, several field trials on adaptive capacity of different varieties of adlai to local agro-climatic conditions are conducted by different research institutions across the country.

Adaptability trial on varieties of adlai was conducted in General Santos city to evaluate its growth and yield performance under the weather condition of the city that falls under type I with two pronounced seasons, dry from November to April and wet during the rest of the year with maximum rain period from June to September. Another adaptability trials and seed production of adlai was made at the experimental site of Bicol Integrated Agricultural Research Center (BIARC) in which three indigenous varieties of adlai were planted, the Gulian, Ginampay and Tapol. The results of the first trial showed that tapol variety produces the highest yield. The SANREM – CRSP (2012) has recently tested different varieties of adlai grass for CAPS as a substitute to rice and maize in the Mindanao region at research site in Claveria. Kiboa has the highest grain yield of 3.5 tons per hectare and a total dry matter yield (TDMY) of 8.8 tons per hectare, followed by the ginampay variety with a grain yield of 3.0 tons per hectare and a TDMY of 7.4 tons per hectare while tapol variety was the poorest performer. It appeared therefore, that Kiboa was the most adaptive in the area.

It is evident from the cited studies that adaptability trials of different adlai varieties had been focused only in Southern and Northern part of Mindanao. Adlai in Northeastern Mindanao is not known and the information about the crop is very much limited particularly its growing performance and cultural practices. The notion of using the crop as climate change adaptation strategy is not yet proven in the region. These are underlying reasons and foundations of the study in pursuing adaptability trials of the five varieties of Adlai, kiboa, ginampay, gulian, tapol and unknown variety in San Miguel, Surigao del Sur, Mindanao, Philippines. This study claimed that better growth and development of one adlai variety could not be presumed that the rest of the varieties will do and exhibit the same performance since each of them may have different site requirement. Hence, this study intends to evaluate the adaptive capacity of adlai's different varieties

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through assessment of their vegetative and reproductive structures as maybe influence by various environmental factors.

Municipality of San Miguel, Surigao del Sur falls under Type II climatic condition of the country, which is characterized by rainfall distributed throughout the year, with a negligible short dry season, although there is a distinct rainy season which begins from the month of November and ends in March. The climatic behavior of the province for the past few years, however, has shown variations wherein the onset of the rainy season no longer occurs on the usual time. Months with low rainfall are from July to October with September as the driest month and wet months are from November to June with January as the wettest month. At this time, staple food such as rice and corn become scarce resulting to shortage coupled with the price hike. Indeed rice and corn are the staple foods for most Filipinos. During the wet season, growing of corn is hardly possible; hence, the search for alternative crop that can withstand through extreme weather condition is vital.

2.0 Framework of the Study

The study was anchored on the concept that environmental factors affect the growth and development of the plant and the responses of plants varied among different plants. The responses of the plant are exhibited on its morphological structure. Each plant has limitation with respect to climatic factors. Some plants may require large amount of water while others need only few or just enough water to fully activate its physiological processes. Other plants need to be fully exposed to sunlight while others need partial shading for better growth and development.

To a greater extent, soil quality affects the growth of the plants. Fertility, types and pH of soil influence the physiological processes of the plants. Some plants grow best in acidic soil while others may not survive and vice versa. Many plants have better growth in clayey soil while others are stunted. Other plants grow vigorously in clay loam and sandy loam. Many varieties of plants stand strong despite of the presence of biodeteriorating agents. Some plants are resistant to pests and diseases. In general, the effects of environmental factors on plants may be direct or indirect and the responses of plants also varying among plants.

In a broader sense, it was presumed that adlai varieties varied widely in length of growing period and development of morphological structures in response to climatic, edaphic and biotic factors. Variation in morphological development among varieties is dependent on environmental condition of the area. In a strict sense, adlai cultivars are generally much more restricted in their range of adaptation with respect to environmental factors.

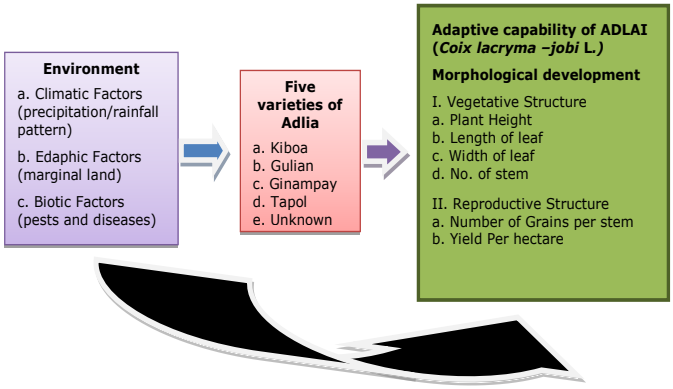

Figure.1. Schematic diagram of the study

Figure 1, the Schematic Diagram of the study, shows the interrelationship between growing environment and five varieties of adlai and the resultant growth and development of morphological structures which describe the adaptability of the varieties. It shows the potential impact of the local climate, the prevailing weather condition, pests and disease and site quality of the area towards the resiliency of five varieties of adlai. The variables used to measure the adaptive capacity of adlai are basically based on the morphological structures that include the plant height, length and width of leaf, number of stems and number of grains and yield. It is presumed that the five varieties may exhibit different heights. Some might have stunted growth and others may grow well as response to extreme volume of water and temperature. Development of leaf might be affected to the presence of the destructive insects and diseases that may appear due to sudden change of the environmental condition that trigger their activity and favor their survival and development. Site quality definitely have great impact to crop growth and development, hence emphasis is also give to it. To determine which among the varieties best adaptive/resilient in the area, the above variables were painstakingly choose as parameters to determine the adaptive capacity of five varieties of adlai.

3.0 Research Methodology

Experimental Design

To gather the necessary data, the study was conducted using randomized complete block design (RCBD) with five (5) treatments and replicated four times. The data were analyzed using ANOVA and decided at 5% level of significance to determine if there are differences or none among the five varieties of adlai. And to further determine the degree of significance among five varieties, comparison of means was conducted using Least Significance Difference (LSD).

Cultural Management Practices

1. Land preparation

The area was prepared thoroughly before planting. It was plowed and harrowed two times at two weeks

interval to permit the seeds to germinate and stubble to decompose.

Lay outing

After the land harrowing, the predetermined Randomized Complete Block Design (RCBD) was laid out in the area, according to the total number of replication and treatments. The perimeter of the area and its boundaries between plots and blocks were carefully delineated including the alley ways with string and meter stick.

Planting

Before planting, furrows were made spaced at 90 cm. Two seeds were sowed per hill at a distance of 60 cm between hills.

Thinning

Two weeks after planting, some excess plants were pulled out to maintain at most two plants per hill.

Off- baring

3-4 weeks after planting, the area was cultivated between rows to remove weeds.

Insect pest and diseases monitoring

To ascertain vigorous and healthy growth of plants, regular monitoring as to the occurrence of pest and diseases was conducted. It was done every morning and late in the afternoon to keep an eye the presence and activity of insect pests. Physical observation was also carried out to monitor symptoms and signs regarding the occurrence of diseases.

Fertilizer application

Thirty days after sowing, complete fertilizer was applied at a rate of one tablespoon full per hill.

8. Harvesting

The crops were harvested by cutting its branches and stems at one foot from the ground level after maturity of grains has started to ripened.

C. Data gathering procedure

1. Plant height (cm)

Ten sample plants were randomly selected as experimental units in data gathering. The height of the plants was measured from the ground level to the upper most leaf of each plant. This was done at 15, 30, 45, 60, 75, and 90 days after sowing until the height has never changed.

2. Length of leaf

This was determined by measuring the length of the leaves at 75 and 90 days after sowing

3. Width of leaf

This was done by measuring the width of the leaf of the ten sample plant at 75 and 90 days after sowing.

4. Number of grains

All the grains in each panicle from the 10 sample plants per variety were counted carefully.

5. Yield per hectare

Yield per hectare were also calculated based on number of grains collected.

4.0 Results and Discussion

Characterization of Adlai (*Coix lacryma – jobi L*.) morphological structures development was focused on the vegetative and reproductive parts. The stem was described in term of plant height and numbers of stem while the leaf in terms of length and width. The fruit was described in terms of number and weight of grains per stem and hill respectively.

The results of the analyses of variance are presented in tabular form and only those with significant results were described further with graphical illustration to give more meaning and clarity of the results. Moreover, the holistic interpretations were made. All the results were treated as one and the relationships between vegetative and reproductive structures development were established

Analysis On The Observation Of The Growth Of Vegetative And Reproductive Structures

Table 1 shows comparative summary observations in the growth of vegetative and reproductive structures of adlai five varieties. These visible development in morphological structures indicated the responses of the crop on the climatic, edaphic, biotic factors and on other environmental factors in marginal land under San Miguel condition, San Miguel, Surigao del Sur. The result shows that, among the five varieties planted, kiboa was the tallest with respect to plant height compared to the rest of varieties while the shortest one is the unknown variety. Furthermore, it has likewise the longest and largest leaf. The unknown variety and kiboa produced more stems than the other varieties. Ginampay, on the other hand, has the least number of stems produced.

Relative to the reproductive structures, tapol produced more grains than the rest of the varieties and it is consistent with the weight of grains per hill. It has the highest yield per hectare followed by kiboa and unknown variety with lowest yield per hectare.

Presentation and Analysis of the Vegetative Structures Development

A. Stem

It is the main trunk of the plant that supports the branches and leaves including the fruits and flowers. It serves as the main channel for the transport of the water from soil through the roots and foods from the leaves to other parts of the plant. To determine the plant height, the stem is measured from the root collar to apical shoot tip.

1. Plant height

Analysis of variance in Plant Height of the Five Varieties of Adlai

Table 2 presents the result of analysis of variance for the average plant height of adlai (Coix lacryma-jobi

Table 1. Summary of observation on Vegetative and Reproductive Structures Measurements

Variety	Vegetative Structures Observation				Reproductive Structures Observation		
	Average Plant Height (cm)	Average Lenght of leaf	Average Width of leaf	Average Number of Stem	Average Number of grains per stem	Average Weight of grains (g) per hill	Average Yield per hectare (ton/ha)
Kiboa	159. 6	76.5	4.5	6	205	125	2.31
Gulian	128.9	69.9	4.3	5	173	100	1.85
Ginampay	117.5	66.8	4.2	4	136	90	1.67
Tapol	152.5	73.2	4.4	5	322	166	3.07
Unknown	111	62.7	4.3	6	105	53	0.98

L.). The result reveals that there is significant difference on plant heights as explained by the p-values which are quite lower than 0.05 level of significance

Fig 2 shows graphical comparison of means for plant height. The means of varieties indicated with the same letter/s is/are not significantly different from each other. The result explains that though Kiboa is taller than Tapol, but comparison indicates that the difference in plant height exists between them is insignificant. Clear marked differences exist in Kiboa and Tapol against Ginampay and Unknown. More so, the height of Gulian differed significantly from all the rest of varieties. The unknown variety although the shortest variety however, it has no difference with Ginampay.

B. The Leaf

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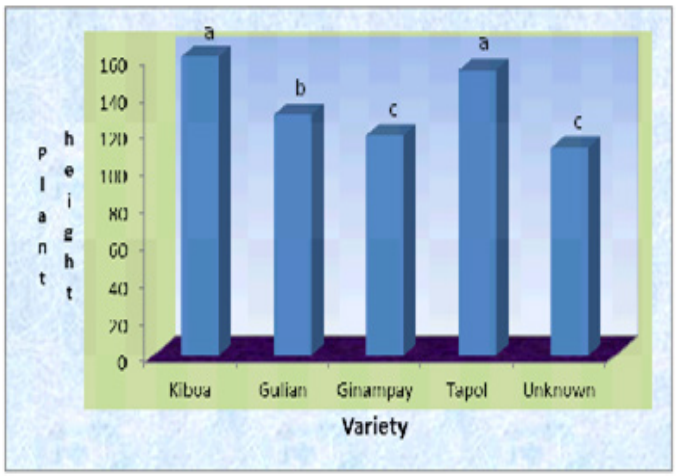

Figure 2. Graph on average Plant Height

than Tapol, but comparison indicates that the difference in plant height exists between them is insignificant. Clear marked differences exist in Kiboa and Tapol against Ginampay and Unknown. More so, the height of Gulian differed significantly from all the rest of varieties. The unknown variety although the shortest variety however, it has no difference with Ginampay

B. The Leaf

Botanically, it is broad and photosynthetic organ of the plant that is usually developed on the node of the stem, branches and twigs. The quality and characteristics of the leaf believed to have an extensive impact on flower initiation as well as fruit setting and development. Generally, the leaf played a major role in the development of the plant. Its growth and development is affected by the climatic, edaphic and biotic factors of the growing area. Hence, its characterization is vital for determination of the most adaptive variety of adlai.

1. The length of leaf

It is essential to describe the leaf development such as the length not just to distinguish each variety from the other, but as a basis likewise in determining the adaptive capacity of the crop in harmony with the local environmental condition, climatic, soil quality and resistance to biodeteriorating agents.

Analysis on leaf length of the five varieties of adlai (*Coix lacryma – jobi L.*)

Table 3 shows the result of the analysis of variance in leaf length. The result revealed that there is a significant

Table 2. Analysis of Variance for Average Plant Height

Source	DF	SS	MS	F	P
Variety	4	7439.505	1859.876	2503.48	0.000
Block	3	6.338	2.113	2.84	0.082
Error	12	8.915	0.743		
Total	19	7454.757			

difference in length of leaves among the five varieties of adlai as explained by the p-value which is lower than 0.05 level of significance.

Above graph in Fig 3, indicates the result of the

comparison of means in leaf length. Varieties indicated with the same or having common letter/s is/are not significantly different from each other. Evidently, all varieties differed significantly from each other in terms of

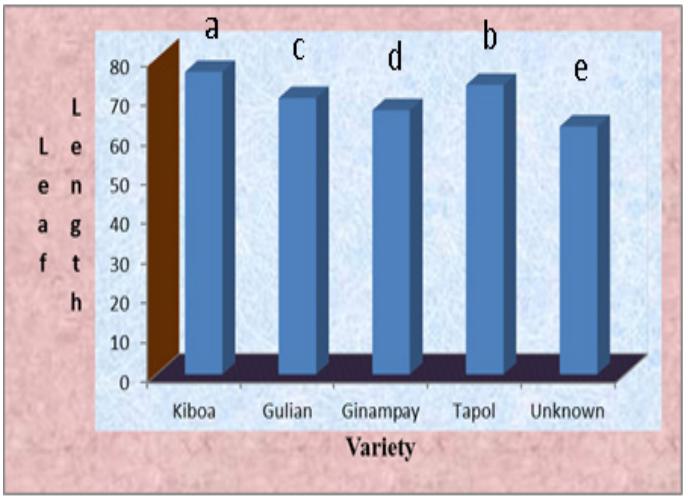

Figure 3. Graph on average Leaf Length

leaf length. Kiboa has the longest leaf length followed by Tapol, Gulian and Ginampay while Unknown variety has the shortest leaf length.

3. Width of leaf

The width of leaf is a good indicator that would speak likewise the adaptive capacity of the crop. Leaf with wider lateral dimension coupled with longer leaves can be perceived as a good sign of crop suitability in the area. The width of the leaf was measured at the center of the leaf. The analysis of variance result in leaf width indicates that there is no significant difference across the five varieties of adlai as explained by the p-value of 0.219 which is quite higher than 0.05 level of significance. This signifies that all varieties have relatively similar in leaf width dimension.

C. Number of stems

The stem produced by each variety is important factor with respect to yield. The number of stems produced signified the suitability of the variety or varieties in the local climate. Hence, its determination and characterization is imperative.

Table 4 shows the results of the analysis of variances

Table 3. Analysis of Variance for the Average leaf length in five varieties of adlai (*Coix lacryma – jobi L.)*

Source	DF	SS	MS	F	P
Treat	4	477.927	119.482	180.55	0.000
Rep	3	2.082	0.694	1.05	0.407
Error	12	7.941	0.662		
Total	19	487.950			

in number of stems produced by each variety of adlai. The result explains that there is significant difference on the number of stems as elucidated by the p-value which is lower than 0.05 level of significance.

Above graph indicates the result of the comparison of means in number of stem developed and produced by

Table 4. Analysis of Variance for the Average number of stems in five varieties of adlai (*Coix lacryma – jobi l.*)

Source	DF	SS	MS	F	P
Treat	4	11.200	2.800	14.00	0.000
Rep	3	7.600	2.533	12.67	0.080
Error	12	2.400	0.200		
Total	19	21.200			

each variety of adlai. Varieties indicated with the same or having common letter/s is/are not significantly different from each other. The result denotes three (3 groups). Kiboa and Unknown represent as the first group, Gulian and Tapol the second group, Ginampay on the third group. Apparently, significant variations exist among the three groups of varieties. However, the third group (Ginampay)

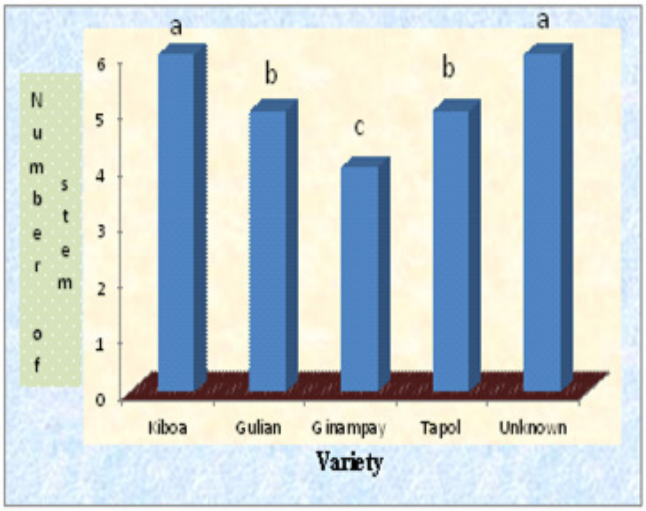

Figure 4. Graph on average number of stem

differed significantly from the last two groups.

Presentation and Analysis of the Reproductive Structures Development

D. The Yield per Variety of Adlai

The yield is the ultimate indicator that will describe the physiological processes responses to the different environmental factors. It is basically analyzed in terms of number and weight of grains.

1. Number of Grains per stem

The number of grains produced by the crop is considered to be the best indicator of crop adaptive capacity to local climatic condition.

Table 5 shows the result of the Analysis of Variance

on the average number of grains per stem. The result denotes that there is significant difference in number of grains per stem as explained by p-value which is lower than 0.05 level of significance.

Figure 5 shows the graphical differences as to average the number of grains produced by each variety of adlai. This variation is explained by dissimilarities of letters indicated above each bar graph after comparison of means. Clearly, Tapol appear to produce more grains compared to the rest of varieties. This was followed by Kiboa and Gulian having relatively the same in number and then Ginampay. Unknown has the lowest number of grains produced.

Table 5. Analysis of Variance for the average number of Grains per stem in Five Varieties of Adlai (*Coix lacryma-jobi L.)*

Source	DF	SS	MS	F	P
Treat	4	110918.2	27729.6	8.8E+04	0.000
Rep	3	7.0	2.3	7.32	0.005
Error	12	3.8	0.3		
Total	19	110929.0			

2. Weight of grains per hill

The weight of grain is good determinant to assess the adaptive capacity of the varieties of adlai. It can be used to predict the amount of carbohydrate including other compounds synthesized in the course of photosynthesis and by other physiological processes that were stored in the seeds. These products of metabolic processes would define the general responses of the crop to the

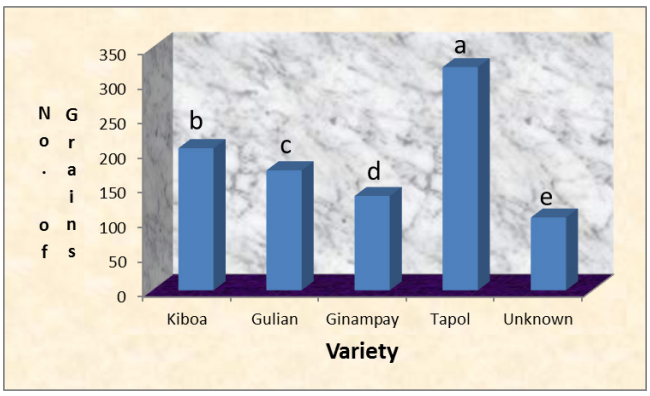

Figure 5. Graph on average number of grains

environmental conditions.

Table 6 displays the result of the analysis of variance on grain weight. The result shows that on average grain weight, there is significant difference among the five varieties of adlai based on the p-value which lower than 0.05 level of significance.

Apparently, based on the above graph, all varieties are varying in grain weight. Different letters designated above each bar representing the variety, indicated after the comparison of means, revealed wide variation in grain weight per hill. Tapol has heavier grains, followed by Kiboa, Gulian and Ginampay. Unknown has the lowest grain weight.

3. Yield per Hectare

The grain yield per hectare of each variety is crucial and need to be determined for it is the basis in making economic analysis and the deciding factor whether the crop is adaptive in the area or not.

Table 6. Analysis Of Variance for the Weight of Grains per Hill per Variety

Source	DF	SS	MS	F	P
Treat	4	28592.2	7148.05	358.90	0.0000
Rep	3	9.75000	3.25000	0.16	0.9191
Error	12	239.000	19.9167		
Total	19	28841.0			

Analysis on the Average Yield of each Variety of Adlai

As presented in table 1, Tapol produced the highest grain yield followed by Kiboa, Gulian and Ginampay. The unknown variety appears to be the poorest performer variety with the least grain yield.

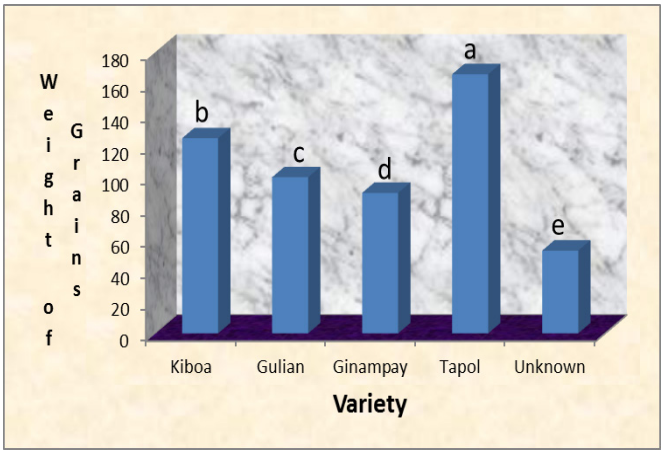

Figure 6. Graph on Average weight of grain per variety per hill

Figure 7 vividly shows the differences on grain yield produced by each variety of adlai. The graph supports the grain yield presented in table 1 wherein Tapol and unknown variety surfaced to be varieties with highest and lowest grain yield produced respectively.

PEST AND DISEASE MONITORING

The presence of biotic factors such as insect pests and diseases in the area absolutely could not be avoided. They will definitely affect the yield if the crop under attack is less resistant. Hence, to determine and assess the resistance of the five varieties of adlai, constant monitoring was conducted. Below are some of pests and diseases observed and found in the crop.

Analysis on Insect Infestation and Disease Infection

Table 7 presents the insects and diseases that were infesting and infecting including the degree of damaged made on the morphological structures of adlai. Evidently, there were number of insects that had attacked the crop. In spite of this, the crop stood vigorously and resistant against biodeteriorating agents and non-infectious diseases as explained by the result of the analysis on

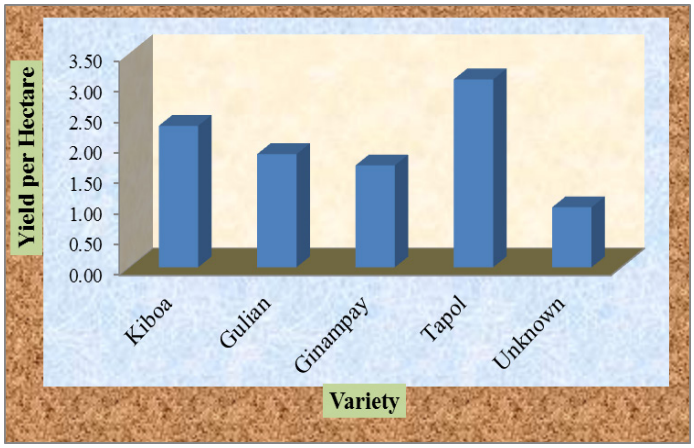

Fig.7. Average yield per hectare per variety

the extent of infestation and infection in which majority of the effect is below Economic Threshold level. Besides, there were also beneficial microorganisms that served as natural enemy that control the population against harmful organisms.

Interpretation of the Results

The results of the study affirmed the claim that better growth and development of one adlai variety could not be presumed that the rest of the varieties will do and exhibit the same performance since each of them may have different site requirement. The results are likewise in harmony with the concept that environmental factors affect the growth and development of the plant and the responses of plants varied among different plants.

The significant results on the statistical analysis of the data as per agronomic trait exhibited on the crop morphological structures are clear-cut manifestation that each individual variety of adlai behaves in various ways as immediate responses to the local environmental condition of the area. The five varieties of adlai vary in almost all of the plant structures all-throughout the growing stages of the crop beginning from development of vegetative parts until fruit setting and development.

The vigorous long standing crops, lengthy and wider leaves coupled with minimal damages from pests and diseases are essential signs for the adaptive capacity of the crop to new climatic, edaphic, physiographic and biotic factors. However, differences in sizes and lengths of the morphological structures maybe natural and distinct botanical characteristics to each variety of adlai and had just been improved or degraded only by current environmental condition of the area. The superiority of Kiboa in many vegetative structures over the other varieties and the early fruit production at 75 days after sowing (DAS) supports the notion that it is adaptive in the area.

Conversely, Tapol under the local condition, though not as superior as Kiboa with regards to vegetative structures growth and development, appears to have an outstanding performance especially on grain yield with total produce of 3.07 tons/ha which is considerably higher than the rest of varieties. This result coincided with the finding of the field trial conducted by Bicol Integrated Agricultural Research Center (BIARC) wherein Tapol had the highest yield among the three varieties tested. On the other hand, though Kiboa has a little bit lower grain yield than Tapol but its performance under local condition cannot be discarded since it has closely followed with Tapol and even surpassed it in some traits. The good performance of the Kiboa asserted that it is adaptive in

Table 7. List of Insect Pests and Diseases

	Local/Common Name	Order	Variety Occurred	Degree of infestation
Insect	Leaf aphids	Hemiptera	All varieties	Below ETL
	Leaf hopper		All varieties	Below ETL
	Flies	Diptera	All varieties	Below ETL
	Black beetle	Coleoptera	All varieties	Below ETL
	White Moth	Lepidoptera	All varieties	Below ETL
	Leaf miner		All varieties	Below ETL
	Cut worm		All varieties	Below ETL
Diseases	Sheath blight		All varieties	Below ETL
	Dead heart		All varieties	Below ETL
	Leaf Scorching		All varieties	Below ETL
Arachnid	Spiders	Unknown	All varieties	None

the area and this has supported by the finding of the field trial conducted in experimental site in Claveria wherein Kiboa was the topmost performing variety among the three varieties tested.

These essentials information explain that the environmental conditions not just enhanced the physical characteristics of the crop but have facilitated as well the physiological processes particularly on photosynthesis, assimilation and reproduction processes. The different findings including the output of this study and of those in earlier studies suggested that each variety had distinct site quality requirements.

Furthermore, the crops showed likewise strong resistance against biotic and abiotic agents of destruction. The level of damage inflicted by insect pests and diseases as well as extreme weather condition was negligible as it wasn't reached the Economic Injury Level (EIL) though it was planted in low quality soil and during wet season wherein volume of rainfall is beyond normal condition. Moreover, the presence of natural enemies such as spiders helped control the population density of harmful organisms. The effect was generally below Economic Threshold Level (ETL) and therefore, the impact of damage has no economic significance on yield.

The five varieties of adlai were planted intentionally to idle marginal lands with low quality soils as well as adverse weather conditions and yet, they survived and produced sizable grain yield. It is believed therefore, that if the crop will be planted during regular cropping period and in an area with good quality soils or if the edaphic factors will be improved, modified or enhanced, the growth and development of the crops principally the grain yield might be doubled or even tripled depending on the kind of soils or degree of modification conducted. On the contrary, the results might likewise be reversed. This means that, it could be Kiboa or the other variety will do a good performance.

Taking into account the overall growth performance of Tapol and Kiboa on vegetative structures development and grain yield, the two varieties therefore can be deemed as the primary crop to be planted in marginal areas and during extreme environmental conditions. Hence, the crops will then serve as potential sources of food chiefly during lean period that substitute the rice and the maize.

5.0 Conclusion

Generally, all the varieties behaved differently as their responses towards various climatic, edaphic and biotic factors of the area that were manifested on their varying morphological structures. The environmental factors have different influences on the two definitive growth stages of adlai. Under the local condition, Kiboa developed better vegetative parts with relatively high grain yield. The local *climatic and edaphic factors* triggered Kiboa to early floral induction and grain development. On the other hand, Tapol produced the highest number of grains with comparatively robust vegetative structures as immediate responses to the present environmental condition. Moreover, the local conditions regulate the late floral setting and fruit development of Tapol.

All the varieties are resistant to deteriorating biotic and non-biotic factors. The presence of natural enemies controlled the population density of insect pests and diseases including damages inflicted to Economic Threshold Level (ETL). Damages caused by pests and diseases have no economic implication and significance.

Finally, considering the vegetative growth, yield performance and pest resistance, the best adaptive varieties under the local condition were Tapol and Kiboa. Gulian and Ginampay were fairly adaptive and the least adaptive was the Unknown variety. Therefore, in effect, Tapol and Kiboa are recommended to be planted in marginal land under San Miguel climatic condition. Furthermore, similar studies should be made in different places that in addition to varietal trials, agronomic characterisation of adlai varieties, must include succeeding ratoon yield performance, and production and harvesting practices and other factors.

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