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Fruit yield potential of Lubeg (*Syzygium lineatum* (D. C. Merr. & L. M. Perry) an endemic tree of Cagayan Valley Region: Its identification and morphological characterization

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Abstract

Lubeg *(Syzygium lineatum* (D.C. Merr. & L.M. Perry) which belongs to the family Myrtaceae is commonly found in the Cagayan Valley region, particularly in first district of Cagayan, Philippines. Thirteen (13) existing long grown tree at Cagayan State University at Lal-lo Campus were evaluated. Identification, morphological characterization of the tree, leaf, fruit and seed was preliminarily evaluated, to include the tree's yield potential in September to October fruiting season. A grown fruiting tree of Lubeg in Cagayan is erect, with an average height of 11.307 and ranging from 6.30- 12.25 meters with a canopy spread of 7.63 meters or ranging from 6.0 to 12.5 meters. The leaves are elliptical in shape measuring about 9-12cm in size with entire margin and generally with acute leaf apex. The ripe fruits are very dark reddish purple berry, glubose to cherry-like in shape with white pulp/flesh, while the half- ripe fruits are pinkish to red berry in color. The fruit weight is ranging from 1.2 to 6.9 grams with an average diameter of 2.95cm and ranging from 2.1cm to 4.1cm. The pulp or flesh of the fruit is sour to very sweet seed depending to its variety. The edible portion/pulp per fruit is 77% in terms of weight with one dicot seed. The tree is an endemic plant of Lal-lo, Cagayan. The tree bears fruits twice a year, in the months of July and October, respectively. A Lubeg tree has an average yield potential of 48.88kg per tree per harvest. The ripe fruit is traditionally eaten raw, used for wine and vinegar making and considered by the rural folks as a good source of nutrients and potential source of income of Cagayanos, Philippines.

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Introduction

Cagayan's major agricultural products are rice, corn, peanut, beans, fruits, cattle, hogs, carabao, poultry and fish. One of the natural resources such as fruit trees indigenously found in region 2, particularly in the Cagayan Valley region is Lubeg tree. At present the Cagayan province is planted with estimated 1,000 Lubeg trees, while forty present (40%) of total production is in Apayao Province. The tree is an erect, medium fruit tree usually 4-5 meters in height, with its leaves usually ovoid to elliptical measuring about 8-10cm. Lubeg are oblong cherry-like fruits with thick and fleshy, spongy, leathery or brittle rinds and swell up to 13 mm long. The fruits are in cluster, whitish in appearance; gradually turn into red to violet as they ripen. The fruits are highly perishable. The roots and young shoots are used in local medicine. The bark is a source of tannins while the wood is used for tool handles and construction of houses. The leaf possesses sour taste. The fruits are believed to have anti-oxidant and anti-cancer properties. In the Cagayan province, existing trees are mainly used for fruit production, particularly in Lal-lo and nearby municipalities.

Although Lubeg is used as raw material wine, vinegar, jam, jelly and fruit concentrates, this remains undocumented and if there is, information is still very limited. Its agro-climatic requirements, ecological, social and environmental as well as its economic potential are still unknown and understudied. So far, no related study has been conducted to develop package of technologies on Lubeg production, and Lubeg products and by-products. Specifically, no attempt has been made to (1) document the existing Lubeg varieties in the Cagayan Valley Region and (2) to evaluate different agronomic and cultural management practices for Lubeg on fruit yield and quality. Aside from this, its many would be potential uses are also under studied, from its fruit, shoot and root components. Its nutritional, pharmaceutical, and medicinal value are still researchable areas, thus a research is conceived to determine the potential yield capacities per tree per harvest to appreciate its economic value. Generally, the research study was conducted to evaluate the fruiting yield of Lubeg particularly at Cagayan State University Lal-lo Campus. Specifically, it aimed to (a) identify and characterised the existing trees in Lal-lo, Cagayan (2) it aimed to determine the fruiting yield capacity of Lubeg in one fruiting season in terms of total weight of harvested fruit/tree, total weight of marketable fruit/tree (kg), total weight of non-marketable fruit/tree (kg); average weight of a fruit, fruit flesh and seeds ratio.

Materials and methods

Identification and Morphological characterization

Thirteen (13) *lubeg* trees in CSU Lal-lo Campus, Lal-lo, Cagayan were selected randomly in the area. The obtained data based on objectives were subjected for identification using macro and descriptive characteristics, and by the aid of following keys and references (Chua LK., 2019). Average plant height, in meter (m), trunk diameter in (cm) and plant canopy in meter (m) were gathered in 13 Lubeg tree randomly.

Fruit Yield

Lubeg fruits were harvested during maturity and ripening stage. The fruits through handpicking method while out of reach fruits were harvested by extremely shaking the stems of the tree until the fruits fell down. To ensure the freshness of the fruit, net or canvass has been widespread under the tree through the use of trellis before shaking it. This method was done in order to avoid damage and to maintain the freshness of Lubeg fruit. Marketable fruits were separated from non-marketable by identifying its appearance and freshness whether it is damaged-free while non-marketable are those fruits prone to damage due to the strong impact of falling down on the ground. The data on (a) total weight of harvested fruit/tree from October-November (kg); (b) total weight of marketable fruit/tree (kg); (c) total weight of non-marketable fruit/tree (kg); (d) average weight of 10 sample fruits, flesh and seeds (g) and (e) average diameter of 10 sample fruits (mm) were gathered.

Results and discussion

Identification and Morphological Characterization

Syzygium lineatum (D.C. Merr. & L.M. Perry) is a member of the family Myrtaceae (Fig. 1a).

The family contains 144 plant genera and includes 13,815 scientific names of species rank and of these, 5,774 are accepted species names (OC. Ruma, 2016). Table 1, 2 and Fig. 1 show the descriptive comparison and differences of information of *Syzygium lineatum* (D.C. Merr. & L. M. Perry) exist in the literature and the *Syzygium* plant locally known as Lubeg by Cagayanos in Cagayan Valley, respectively. The trees are mostly grown in the wild and backyards of Lal-lo, Cagayan. The Lubeg tree believe to be endemic of Cagayan is known to be found also in Indonesia, Southeast China, Vietnam, Myanmar, Thailand, Singapore, Malaysia, Brunei, and the Philippines. There are 180 species of *Syzygium* distributed in the Philippines.

Lubeg is one among the identified native tree species at *Minalungao* Park, Nueva Ecija (EG. Dela *et al.,* 2018). Lubeg trees also thrive in the North-Western, Cagayan where they grow abundantly specially in the town of Lallo. "Lubeg" trees were found planted and grown vigorously, naturally and endemically in the in Region 2 and in the municipality of Lal-lo. Most of the collection of samples for its phytochemical study (RE. Coronel, 1998) and propagation (AT. Gonzales, 2018) were collected in the said municipality. This species was also a lesser known species inhabiting the province of Apayao (MZ. Manicad, 2016). Other nearby province also found to have this tree growing and the locals recognized this tree as Malibago which is an indigenous edible plant and were collected and identified in six towns of Southern, Isabela (OC. Ruma, 2016).

Fruit and seed characteristics

The Lubeg fruit generally occur in loose cluster, vary in size ranging from 25.9 to 37.6mm. The fruit is a berry, spheroid to globose in shape and has an average weight of 13.67g. The peel is smooth, shiny and thin, fibrous white to pinkish in color. The half-ripe fruit is light red but turned to very dark purple when full ripe. The ripe fruit is smooth, shiny, juicy and varying pulp from white to deep red to dark purple flesh. The fruit is odorless, and is pleasantly flavored with a mild acid and astringent taste. The fruit contains one globose to spheroid seed with an average weight of 3.32g. The seed recoverable pulp is 75.71% based on weight.

Fig. 1. Lubeg tree (*Syzygium lineatum*) of Lal-lo, Cagayan.

Tree and leaf characteristics

The Lubeg tree and leaf characteristics are shown in Table 2 and Fig c & d. The tree can grow up to an average height of 11m tall with an average trunk diameter of 48.30cm and with a canopy diameter averaging to 9.72 meters. The leaves are opposite, entire, and smooth in texture. They are elongated somewhat elliptically lanceolate, sometimes elongated oblong in shape. The older leaves are slightly dark green while the young shoots or leaves are light green in color. The leaf blades measure an average of 18cm long and 6cm width.

Yield and Yield Potential

Lubeg trees in the municipality are observed to bear fruits twice a year, i.e., in the month of June-July and October-November. Yield varies greatly among trees observed and may be as high as 96.5kg but the average harvested fruit is 48.88kg per harvest per tree. The data in table 1 is only in the month of October. Thus, can be doubled if the July harvest is considered.

Locally, as per personal interview with Lubeg fruit tree owner, these Lubeg fruits are processed into wine, vinegar, jam and jelly. So far, according to one of the Lubeg wine processor (personal interview), seven kg of Lubeg fruit pulp can produced an average of 13 liters of wine that can be sold at P150.00-180.00 per bottle. The great economic potential of Lubeg tree to the lives of Cagayanos is high if the economic uses and importance of the tree is properly investigated, studied and documented.

Preliminarily, the *Syzygium lineatum* (D.C. Merr. & L.M. Perry) in the existing literature is quite different in the Lubeg tree endemic of Cagayan in terms of fruit and seed, leaf and tree characteristics. However, rigid studies are still undergoing, to confirm its distinct differences and similarities. Several studies are also undertaken to explore on the yield potential, its propagation and other related agronomic characteristic and food value and uses.

Table 1. Descriptive information available regarding *Syzygium lineatum* (D.C. Merr. & L. M. Perry)[1].

a. General Information. The tree is evergreen, sub canopy tree growing up to 30 meters tall (http://www.nationalherbarium.nl /Sungaiwain), straight ball as occasionally stilt-rooted, it can be 40-60 cm diameter (http://211.11421.20/ tropical plant/index.jsp). The tree is harvested from the wild for local use as a food and source of tannins and timber.

b. No known hazards *(no information)*

c. Botanical references *(no information)*

d. Range. Found in East Asia- Southern China, Myanmar, Thailand, Vietnam, Malaysia, Indonesia and Philippines

e. Habitat. Disturbed forests and regrowth, also in undisturbed swamp, keranga, mixed diptocarp and sub-montanna forests at elevations to 2,000meters. Thye found usually on alluvial, swampy sites by rivers and streams, also on hillsides and ridges

f. Properties

1. Edibility rating ++
2. Medicinal rating +
3. Other Uses rating ++
4. Habit – Evergreen
5. Height – 25m
6. Pollinators- Bees, Insects
7. Cultivation Status – Wild

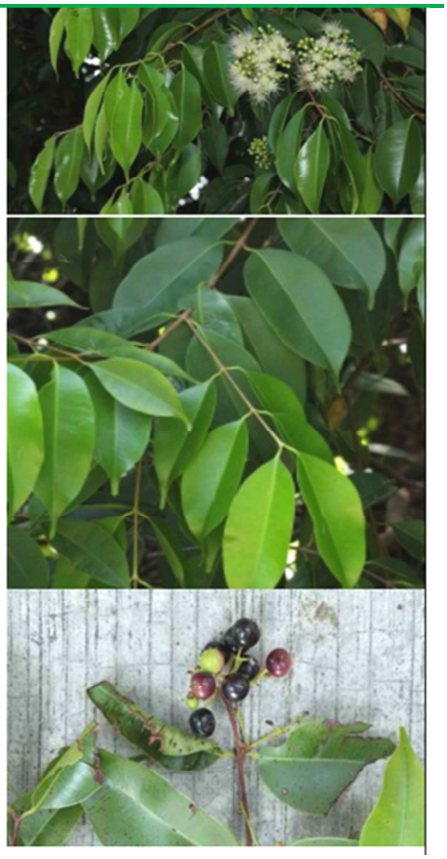
g. Cultivation Details- *They* grow in the wild on sandy soils, and also on limestone

h. Edible Uses. The pulp of the fruit is eaten. The fruit is berry with thick and fleshy, spongy, leathery or brittle rind, oblong-ovoid or ellipsoid, up to 13mm long.

i. Medicinal Uses. The roots and young shoots are used in local medicine

j. Other Uses. The bark is a source of tannins and the wood is used for tool handles and the construction of houses

k.Propagation - Seed- best sown as soon as it is ripe



The data is lifted after the website (http://www.theplantlist.org/browse/Myrtaceae)

Table 2. Fruit, seed, leaf and tree characteristics of Lubeg of Lal-lo, Cagayan, Philippines[1].

Parameters evaluated	Description
Fruit	
Weight (g)	13.67
Diameter (mm)	29.67
Shape	Globose
Color	Light pink (immature) Dark purple (ripe)
Seed	
Shape	Globose
Color	Dark brown peel
Peel	
Color	Thin Dark purple (ripe)
Texture	Fibrous and juicy
Thickness/Pulp (g)	10.13
Leaf	Elongated elliptically
Shape	lanceolate
Base	Cuneate
Apex	Acuminate
Texture	Thin, shiny and
Margin	Entire
Venation	Reticulate distinct
Arrangement	Opposite
Blade color of mature leaf	Slightly dark green
Blade color of young leaf	Light green
Length (cm)	15
Width (cm)	5.5
Tree	
Trunk diameter(cm)	48.30
Harvest season	August & October
Canopy spread (m)	9.72
Tree height (m)	11
Ave. Yield (kg./ harvest/tree)	48.88

[1]The data were average of 13 Lubeg trees randomly selected in existing in CSU Lal-lo, Cagayan, Philippines

Conclusions

Identification and morphological characterization of Lubeg tree endemic of Cagayan Valley region showed that it is a medium-height tree ranging from 6 to 12.75 meters and a canopy spread of 9.72 meters and a trunk diameter of 48.30cm. It bears fruit twice a year with a very high yield reaching to more than 96kg per harvest/year. The fruit is spheroid to globose berry with the size ranging from 25.9 to 37.6mm and weight of 13.67g. Lubeg is a fruit of limited distribution in the Philippines and believe to be endemic of Cagayan Valley Region. It is a good example of a tree that is noticed only during its fruiting season and is practically neglected the rest of the year. A favourite fresh fruit among Cagayanos, it may be developed as potential industry, a potential money earner for the country because it can be processed commercially into different food products. With the limited information about the tree, the distinct differences and similarities with the existing information about the tree must be confirmed. Studies to explore on the yield potential, its propagation and other related agronomic characteristic, its acceptability, its nutritional values and properties must be studied.

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