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# Idiotypes and consumer preferences of kenari seeds (*Canarium indicum*) in Ternate Island based on agronomy character

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**Abstract** North Maluku is one of the Kenari (*Canarium indicum*) hotspots in Indonesia. On the Makean island this plant is abundantly spread as a forest plant. Kenari productivity on the Makean island is in the high category. The main crop of this plant is kenari seeds which are used by the community as a mixture of cakes and air guraka, halua and walnuts. There are several agronomic variations of kenari seeds that are sold on the Ternate city market. This study aims to analyze the idiotype and the level of consumer preferences for kenari seeds on the Ternate island. Descriptive survey research was conducted to collect data. This research was conducted in Maret until June 2020. The instruments used were questionnaire and interview guides. Respondents from 80 people consisting traders, garden owners, and consumers (housewives, students, public servants and entrepreneurs). People on the Ternate island have a tendency to choose fruit characters: whole fruit (fresh); Size: medium to large (at least 25 g); Shape: short-oval to round. Characteristics of kenari seeds (dried bottom): Size: medium to large (at least 10 g); Short-oval to round shape; % beans filled: at least 90%. Skin character (dry base): Thickness: moderate to thin thickness (no more than 4.00 mm). Content/kernel character (dry base): Size (including testa): medium to large (at least 2.5 g); White color. Idiotypes and preferences of seed consumers can be used as preliminary data for SNI standard superior kenari seed breeding programs.

## 1. Introduction

Kenari (*Canarium indicum* L.) in North Maluku is a food commodity. The most important product from kenari is the seeds. Thomas and Evans (2004) reported the chemical composition of fresh kenari, namely water content of 35.4 g, protein 8.2 g, fat 45.9 g, sugar 0.2 g, starch 0.3 g, and ash 2.6 g [1]. Kenari seeds are a type of beans that have antioxidant content, namely polyphenol compounds [2]. Some of the antioxidant content found in kenari seeds makes kenari have many benefits. The highest content of dried kenari is fat (65.15%), protein (13.06%) and water content (5.20%) [3].



Kenari seeds are an important food source and can be used as an export commodity because of the high fat and protein content that can contribute to the savory taste of food. In North Maluku kenari seeds are used as the main ingredient of halua kenari typical of the island of makean, food additives, North Maluku specialties and additives for making bagea cakes, macrone and aer guraka drinks typical of North Maluku. The function can provide the savory taste of kenari in this food product, making kenari have high economic value and is very important to be developed commercially.

There are two species of kenari in Indonesia, namely *Canarium vulgaree* Leenh and *Canarium indicum* Leenh. *Canarium vulgaree* Leenh. there are many in Sangihe Talaud, Sulawesi, Flores, Maluku, North Maluku, while the *Canarium indicum* Leenh is mostly found in Sulawesi, Maluku, North Maluku [4]. According to Djarkasi et al. (2007), kenari are oval-shaped to slightly rounded, with morphological dimensions of 2-4 x 4-6 cm, and are generally green when young, turning dark green rather dark to black [5]. Kenari consist of outer skin (exocarp), flesh of the fruit (mesocarp), and the shell and contents (endocarp). The endocarp part, often referred to as a nut-in-shell (NIS), consists of a shell and seeds wrapped in epidermis (testa). Seeds separated from testa are edible portions.

In general in Indonesia, kenari plants are forest plants and have not been widely cultivated. Kenari often grow in eastern Indonesia, such as Sulawesi, Maluku and North Maluku. In North Maluku and Manado, kenari is a food commodity that has an ever-increasing market share from year to year. In Maluku, the kenari season varies from region to region so this also causes canaries to be available throughout the year. In North Maluku kenari seeds produced by almost 99% are processed into dry kernel seeds. Dried kernel seeds produced by the kenari farmers community on the islands of Makean, Tidore and Halmahera are generally directly sold to collectors. During this time the selling price of kenari skin IDR. 25,000/kg, the low selling price has caused the community to process kenari seeds in the form of dry kernel seeds with a relatively higher selling price in the market of IDR. 120,000/kg [6].

Kenari agribusiness in Indonesia is still not widely developed, this is because the kenari commodity is still limited to certain regions and circles. However, that does not mean that kenari in Indonesia do not have a good market share. To increase kenari seeds. Farmers must be more observant in choosing varieties of kenari that consumers like, because the symptoms of losses arising from inaccurate selection have only been seen for a long time, thus harming farmers and entrepreneurs. The initial step to overcome these obstacles is to formulate the idiotype character that is in accordance with market demand and profitable for producer farmers and traders.

Idiotype characters are literally interpreted as a form or model that describes an idea. So far the concept of idiotypes is generally used by plant breeders to describe the plant model that will be the target of breeding programs. An idiotype describes in detail the ideal attributes of plants for specific purposes, which can be product quality or certain consumers, also producers and traders [7-11]. An idiotype can also describe the function of time and food safety [12].

The idiotype character is important as a basis for national kenari development activities and for variety selection and improvement activities [13,14]. Product attributes must always be strived to be ahead of consumer preferences, or at least in line with consumer preferences [15]. Determination of the idiotype character of a plant is an integrative activity between socio-economic aspects and the purpose of plant breeding. The results of the formulation are a reference for plant breeders in assembling new superior varieties that are in accordance with the preferences of the majority of consumers, so that their products can be accepted by the market. The objective of this research is to formulate national kenari idiotypes based on consumers' preferences about the physical character and taste (biophysical) of kenari seeds.

## 2. Research Method

Research about consumer preferences of kenari seed in Ternate island was carried out by survey and interview methods. The survey was conducted from March to June 2020 in 4 villages in Ternate city. The selection of this location is assumed to represent the location of kenari seed sales centers and food products made from kenari seeds, namely in Bastiong, Gamalama, Falajawa and Dufa dufa. In two

special locations, Gamalama and Falajawa markets are the marketing centers of food typical from North Maluku. The sampling technique was considered (purposive random sampling) of 80 respondents. Respondents consisted of traders, garden owners and consumers (kenari seed buyers: housewives, tourist, chef of traditional cake base on kenari, students, civil servants and entrepreneurs).

Consumer preferences are the main target of the information reviewed through this survey, so that in addition to general consumers, traders, and kenari farmers are important respondents because they are directly related to consumers. The information to be studied from respondents consisted of 4 agronomic characters of kenari fruit and kenari seeds, namely: fruit size, fruit shape, seed size, seed shape % kernel contents; skin characters in skin thickness, content/kernel characters: kernel size, kernel color and kernel taste. The list of information to be extracted is then compiled in the form of a closed questionnaire with each character divided into categories based on general conditions that are usually the concern of consumers in selecting kenari seeds and fruit, ie fruit characters: whole fruit (fresh); Size: medium to large (at least 25 g); Shape: short-oval to round. Characteristics of kenari seeds (dried bottom): Size: medium to large (at least 10 g); Short to round oval shape; % beans filled: at least 90%. Skin character (dry base): Thick: medium to thin thickness (no more than 4.00 mm). Content / kernel characters (dry bottom): Size (including testa): medium to large (at least 2.5 g); White color [2]. Data were analyzed descriptively to explain the number of respondents who chose a category of kenari seeds and fruit characters depicted using tables and histograms. Determination of the dominance of 1 character category over the other categories was based on the percentage of respondents' preferences.

### 3. Result and Discussion

Description of kenari seed consumer respondents on Ternate Island based on functional status consisting of civil servants, entrepreneurs, traders, tourist, chef cake, garden owners and students / students and housewives who are the subjects of this study as in table 1 below:

**Table 1.** Description of Respondents Research

| Group of Respondent                                             | Number of Respondents |
|-----------------------------------------------------------------|-----------------------|
| 1. Civil Servants (Lecturers, Teachers, Local Government, BUMN) | 20                    |
| 2. Entrepreneur                                                 | 20                    |
| 3. Kenari Traders                                               | 10                    |
| 4. The owner of the garden                                      | 10                    |
| 5. Student                                                      | 10                    |
| 6. Housewife                                                    | 10                    |
| Total                                                           | 80                    |

Consumer preferences respondents consisted of 20 civil servants consisting of lecturers, teachers, local government officials and BUMN (Banks and ASDL and DLLJR), 20 self-employed respondents consisting of typical food culinary and tourist entrepreneurs and typical souvenir entrepreneurs, 10 kenari traders in the market traditionally, 10 kenari garden owners from Makean, Tidore and Halmahera, 10 students/students and 10 housewives. Kenari fruit and seed consumers used as respondents in this study were people who met in the marketing of Kenari and kenari processed products, typical souvenir and culinary companies and kenari garden owners.

The agronomic characteristics of fruit size, seed size, kernel size and taste of dried kenari kernels generally differ between respondents' status. These different tastes are caused by each attribute of agronomic character having a meaning or relationship to different socio-economic attributes in each

respondent's social status [7,16]. The results of a quantitative descriptive analysis of consumer preferences for kenari fruits and seeds on the island of Ternate as shown in table 2 and figure 1 below:

**Table 2.** Consumer Preferences of kenari Fruits and Seeds in Ternate City

| Biophysical Indicator       | Consumer preferences (%) |
|-----------------------------|--------------------------|
| <b>1. Fruit characters</b>  |                          |
| Whole/fresh                 | 90                       |
| Whole dry                   | 10                       |
| <b>1.Fruit size</b>         |                          |
| Small $\leq 1,5$ g          | 1                        |
| Medium 1,6 – 2,5 g          | 9                        |
| Larg) 2,6 – 3,5 g           | 90                       |
| <b>3. Fruit shape</b>       |                          |
| short                       | 1                        |
| Ovoid                       | 89                       |
| round                       | 10                       |
| <b>4. Character seed</b>    |                          |
| Basic/dry                   | 90                       |
| Basic/fresh                 | 20                       |
| <b>5. Seed size</b>         |                          |
| small $< 5$ g               | 2                        |
| Medium: 5-10 g              | 8                        |
| Large $>10$ g               | 90                       |
| <b>6. Seed form</b>         |                          |
| Ovoid                       | 80                       |
| short                       | 10                       |
| round                       | 10                       |
| <b>7. % kernel contents</b> |                          |
| Less $< 60\%$               | 0                        |
| Full (95%)                  | 100                      |
| <b>8. Skin character</b>    |                          |
| Thic) $> 10$ mm             | 0                        |
| Medium 5-10mm               | 1                        |
| Thin $< 4$ mm               | 99                       |

**9. Kernel character**

|             |    |
|-------------|----|
| Basic /dry  | 90 |
| Basic/fresh | 10 |

**10. Seed size**

|                  |    |
|------------------|----|
| Large >2,5 g     | 90 |
| Medium 1,6-2,5 g | 9  |
| Small <1,6 g     | 1  |
| Kempes (Wrinkle) | 0  |

**11. Seed Color**

|        |    |
|--------|----|
| white  | 90 |
| cream  | 10 |
| Yellow | 0  |

**12. Seed taste**

|           |     |
|-----------|-----|
| tastefull | 100 |
| tasteless | 0   |
| bitter    | 0   |

Source: 2020 primary data processed (Modification from Djarkasi, 2011) [2]

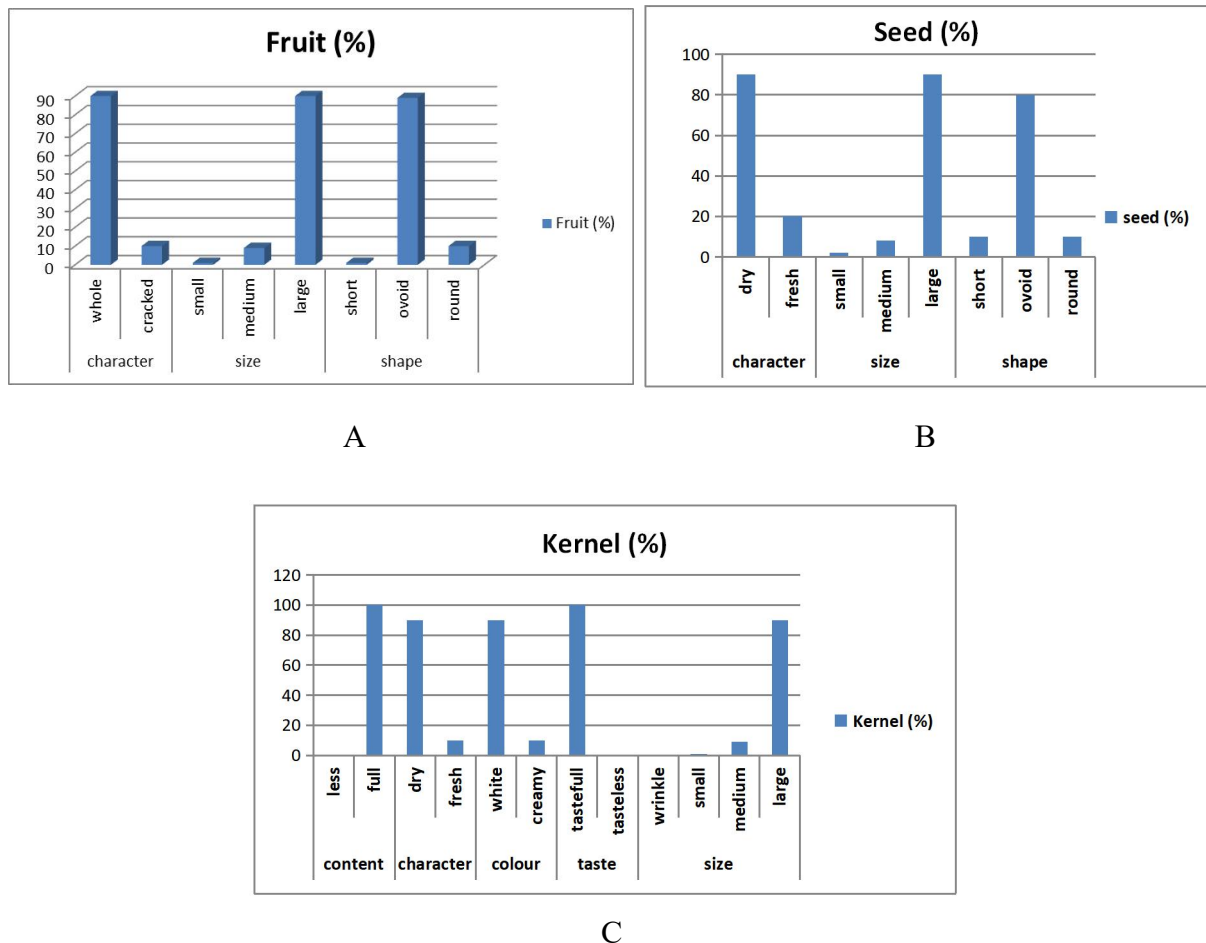


**Figure 1.** Morphological and Agronomy character of Kenari seeds

Consumer preferences for agronomic traits of kenari and kenari seeds generally differ between respondents' status groups. The most preferred and the same agronomic traits among respondents were agronomic traits of white fruit flesh color, savory taste and fluffier (dry) texture, full seeds. Different agronomic characters among the respondent groups are 1) fruit size is the character that becomes the first attribute to be considered by canary seed buyers, fruit size is related to price. Consumers who have large incomes have a high purchasing power to buy large-sized kenari that are relatively

expensive, in contrast for consumers who have lower middle income will choose small kenari with relatively cheaper prices, this is in line with the results of Santoso (2008) and Sundari (2018) [16,17].

The agronomic character of flavor is one of the characteristics of kenari seeds that attract consumers to buy kenari. The shape of oval and round fruit and seeds are relatively well-liked by consumers. Based on the survey results, it turns out that the taste of kenari seeds is tasty and the contents are the most preferred by consumers (Figure 1 A,B, C).



**Figure 2.** A. Percentage of respondents towards the agronomic character of kenari fruit; B. Percentage of respondents towards the agronomic character of kenari seeds; C. Percentage of respondents towards the agronomic character of kernel

Based on table 2 and figure 2 A,B,C it is known that the level of consumer preferences for the biophysical character of kenari and kenari seeds is generally the same, only different in fruit and seed size due to socio-economic factors in each community group. For example, in the falajawa sub-district of Ternate, the majority of respondents liked the size of fruit and kenari seeds for the basic ingredients of cakes and aer goraka drinks. For the community, housewives generally have a taste for medium to large fruit and seed sizes. But at other times typical food entrepreneurs also prefer medium to large size kenari and seeds. Likewise housewives with a small economic level prefer small kenari seeds at affordable prices. This is thought to be related to the level of purchasing power of respondents in the city of Ternate. As consumer preferences are constantly changing, so also the idiosyncrasy changes. To

predict the tastes of kenari seed consumers in the next 10-20 years, it is necessary to know the extent of the tendency of differences among generations of kenari consumers. Kenari seed consumer preferences based on the age of the respondent. From Table 1 it can be seen that the tastes of consumers aged <30 years, 31-40 years, and >40 years show relatively similar levels in the ten biophysical characters of fruit and kenari seeds. Based on this fact, it can be predicted that in the next 10-20 years, consumers' tastes towards kenari will still remain. If there is a tendency for changes in consumer tastes, then the idiotype also change with it. To predict the consumer's taste for walnuts in the next 10-20 years, it is necessary to know the extent to which there is a trend of differences between generations of walnut consumers in the span of that year. To formulate an idiotype, it is inevitable to pay attention to the average taste of all respondents for the attribute of walnuts. The idiotype is a generally accepted reference to characterize a product nationally.

In formulating an idiotype, it is inevitable to pay attention to the average taste of all respondents regarding the attributes of fruit and kenari seed. An idiotype is a generally accepted reference to give a characteristic for a product nationally. Kenari seed consumer preferences are generally shown in Figure 2 A, B,C.

It can be seen that the dominant biophysical characters that determine respondents choose kenari seeds, namely medium to large fruit size (16-25g), oval shape, full seeds, oval shape, thin seed coat, white seed color and savory taste. Fruit size is the first attribute to be considered for kenari seed buyers, because fruit size is related to price. The shape of a full size oval seed and white color is one of the characteristics inherent in kenari seeds. These characters also need to be a concern for planters when choosing varieties to be planted, as well as for kenari plant breeders in conducting selection and improvement of kenari plant varieties in North Maluku.

#### 4. Conclusion

Kenari seed idiotype based on consumer preference data of kenari seeds in Ternate island obtained information that the dominant biophysical character of the determinants of respondents choosing kenari seeds which describes the kenari seed idiotype in Ternate Island currently are medium to large fruit and seed sizes, oval fruit and seed shapes, seed contents full, white and beige seed color. Consumer preferences generally differ between respondents' statuses, but are not influenced by age strata. It is predicted that within the next 10-20 years the kenari seed idiotype is still the same. This idiotype character is suggested as a reference for farmers in choosing kenari varieties to be developed, and for kenari breeders in North Maluku to assemble or select new high yielding varieties.

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