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The diversity of vegetable and fruit fresh traded in the traditional and modern markets in the Bekasi, West Java and its potential

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Abstract

The market is a place for buying and selling food plants and rich in information of plant utilization, including vegetables and fruit. This study aims to explain the diversity of vegetable and fruit plants that are traded in traditional and modern markets in the Harapan Indah area, Bekasi, West Java. A total of 67 respondents were interviewed and surveyed in two markets (traditional market and modern market). A total 60 species of vegetable and fruit fresh have been sold in traditional markets and only 43 species in modern markets. Most of the plants belonging Brassicaceae (7 species), Cucurbitaceae (7 species) and Fabaceae (6 species). The part used dominated of fruits (40 species) and followed leaves (18 species). There are far fewer types of fresh fruit traded in the Harapan Indah market in Bekasi (37%) compared to vegetables (67%). The *Gnetum gnemom* and *Artocarpus heterophyllus* are very potential to be developed into culinary based on local wisdom as well as nutraceutical.

Keywords: *Artocarpus heterophyllus*; *Gnetum gnemon*; Traditional market; Vegetables and fruit

1. Introduction

Indonesia is a country rich in biodiversity, including plants. It is estimated that around 30,000 plant species are found in Indonesia, but their distribution varies from one island to another, even from one area to another. This gave birth to transactions of buying and selling plants, especially those needed as food. Some researchers report that traditional markets are rich in information on the use of biodiversity, including plants [1,2]. Research on the use of plants in the market is very diverse, including medicinal plants [1] and also food plants [2,3].

Ethnobotany is a branch of science that examines the use of plants by local or ethnic communities and is one of the right steps for bioprospection purposes [4]. Royyani and Efendy [5] stated that, maintaining food is very much determined by the availability of diversification or food consumption by the community which can be sourced from various local food plants including vegetables and fruit. By consuming a variety of different foods, the supply of nutrients becomes more complete than dominating only one type of food. Consumption of sufficient vegetables and fruit is one simple indicator of balanced nutrition [6].

Vegetables and fruit are food sources that contain complete and healthy nutrition because they can be a source of dietary fiber, vitamins, minerals, and antioxidants that are beneficial to human health [7,8]. The Regulation of the Ministry of Agriculture [6] provides details that vegetables can be (fruit vegetables, leaf vegetables, tuber vegetables, and mushrooms) and fruit can be (tree fruit, vines and annuals, herb fruit, and shrubs). The recommendation for adequacy of fruit and vegetable consumption according to World Health Organization (WHO) 2003 is 400 grams per day or 3-5 servings a day [6].

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Public consumption of vegetables and fruit is influenced by public knowledge about the diversity of types of vegetables and fruits. This study aims to determine the diversity of vegetable and fruit food plants that are traded in traditional and modern markets, Harapan Indah, Bekasi, West Java and its potential.

2. Material and methods

2.1. Area Study

The research was conducted in September 2021 – January 2022 at Traditional and Modern Markets, Harapan Indah, Bekasi, West Java. Administratively, Harapan Indah market is located in Medan Satria District, Bekasi City, West Java. This city is one of the buffers for the capital city of Indonesia, namely Jakarta.

2.2. Respondents

Respondents in this study were all traders who traded vegetables and fruit in the traditional market and modern market, Harapan Indah, Bekasi, West Java. Respondents were 76 respondents aged between 20-60 years. Traders are dominated by 44 women (57.8%) (Figure 1) while only 32 men (42.1%). Based on the education level, 49 people (64.4%) have graduated from high school and only 9 people (11.8%) have graduated from elementary school.

Figure 1 Characteristics of traders at Harapan Indah Markets, Bekasi, West Java. A. Traditional market, B. Modern market

2.3. Data Analysis

Data analysis in this study was carried out qualitatively and quantitatively. Qualitative analysis was carried out by grouping plants based on taxon, parts used and benefits. To complete the results, secondary data from various research results or scientific journals is also added.

3. Results and discussion

3.1. Diversity of Vegetables and Fruits

Vegetables or vegetables are a general term for plant foods that usually contain a highwater content, which can be consumed after cooking or processing with certain techniques, or in a fresh state. Literally fresh fruit is food that does not require processing and can be consumed directly. Found as many as 69 species spread over 18 families and 40 genera (Figure 2). A total of 9 families were represented by only one species such as Actinidiaceae, Alismataceae, Amaranthaceae, Anacardiaceae, Annonaceae, Apiaceae, Arecaceae, Cactaceae, Caricaceae and Clusiaceae.

Figure 2 shows that the number of fruit and vegetable plants traded in traditional markets is higher (60 species) compared to modern markets (43 species). This is in line with the research of Franco et al [3] that traditional markets provide higher food ingredients compared to supermarkets and some local fruits are only found in traditional markets. A total of 17 species of vegetable and fruit ingredients are only found in traditional markets such as durian (*Durio zibethinus*), avocado (*Persea americana*) and *Lansium parasiticum* fruits (Figure 3). Empirically, it can be seen that the

number of traders in traditional markets is more than in modern markets. This is thought to be related to the rental price of the traditional market which is cheaper than the modern market.

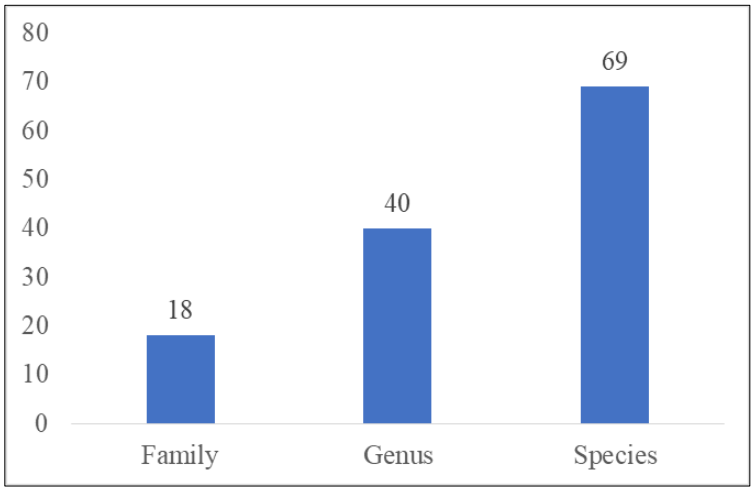

Figure 2 Diversity of vegetables and fruits fresh traded in the traditional and modern markets of Harapan Indah, Bekasi, and West Java

Table 1 Diversity of vegetables and fruits fresh that are traded in the traditional and modern markets of Harapan Indah, Bekasi, West Java

Family	Scientific name	Local name	Uses	Part of uses	TM	MM
Actinidiaceae	*Actinidia deliciosa* C.F.Liang. & A.R.Ferguson.	Kiwi	Fresh fruit	Fruits	✓	-
Alismataceae	*Limnocharis flava* (L.) Buchenau,	Genjer	Vegetable	Leaves, Flower	✓	✓
Amaranthaceae	*Amaranthus* hybridus L.	Bayam hijau	Vegetable	Stem, Leaves	✓	✓
Anacardiaceae	*Mangifera Indica* L.	Mangga	Fresh fruit	Fruits	✓	✓
Annonaceae	*Annona muricata* L.	Sirsak	Fresh fruit	Fruits	✓	-
Apiaceae	*Daucus carota* L.	Wortel	Vegetable	Tuber	✓	✓
Arecaceae	*Salacca zalacca* (Gaertn.) Voss.	Salak	Fresh fruit	Fruits	✓	✓
Asteraceae	*Lactuca sativa* L.	Selada	Vegetable	Leaves	✓	✓
	Cosmos caudatus Kunth	Kenikir	Vegetable	Leaves	✓	✓
Brassicaceae	*Brassica alboglabra* L.	Kailan	Vegetable	Leaves	✓	-
	Brassica juncea (L.) Czern.	Sawi, kubis	Vegetable	Leaves	✓	✓
	Brassica oleracea L.	Brokoli, kol	Vegetable	Flower, Leaves	✓	✓
	Brassica pekinensia L	Sawi putih	Vegetable	Leaves	✓	✓
	Brassica rapa L.	Sawi pokcoy	Vegetable	Leaves	✓	✓
	Raphanus sativus L.	Lobak	Vegetable	Tuber	✓	-
	Nasturtium officinale R.Br	Selada air	Vegetable	Leaves	✓	-
Bromeliaceae	*Ananas comosus* (L.) Merr.	Nanas	Fresh fruit	Fruits	✓	✓
Cactaceae	*Hylocereus undatus* (Haw.) Britton & Rose.	Fruits Naga	Fresh fruit	Fruits	✓	-

Caricaceae	*Carica papaya* L.	Pepaya	Fresh fruit, vegetable	Leaves, Fruits	✓	✓
Clusiaceae	*Garcinia mangostana* L.	Manggis	Fresh fruit	Fruits	✓	✓
Convolvulaceae	*Ipomoea aquatic* Forssk.	Kangkung	Vegetable	Stem, Leaves	✓	✓
Cucurbitaceae	*Citrullus lanatus* (Thunb.) Matsum. & Nakai.	Semangka	Fresh fruit	Fruits	✓	✓
Cucurbitaceae	*Cucubita moschata* Duchesne.	Labu kuning	Vegetable	Fruits	✓	✓
	Cucumis melo L.	Melon	Fresh fruit	Fruits	✓	✓
	Cucumis sativus L.	Mentimun	Vegetable	Fruits	✓	✓
	Luffa acutangula (L.) Roxb.	Oyong/gambas	Vegetable	Fruits	✓	✓
	Momordica charantia L.	Pare	Vegetable	Fruits	✓	✓
	Sechium edule (Jacq.) Sw.	Labu siam	Vegetable	Fruits	✓	✓
Euphorbiaceae	*Manihot esculenta* Crantz.	Leaves Singkong	Vegetable	Leaves	✓	✓
Fabaceae	*Archidendron pauciflorum* (Benth.) I.C.Nielsen.	Jengkol	Vegetable	Fruits	✓	✓
	Pachyrhizus erosus (L.) Urb.	Bengkoang	Fresh fruit	Tuber	✓	✓
	Parkia spesiosa Hassk.	Petai	Vegetable	Fruits	✓	✓
	Phaseolus radiatus L.	Tauge	Vegetable	Sprouts	✓	✓
	Phaseolus vulgaris L.	Buncis	Vegetable	Fruits	✓	✓
	Vigna unguiculata (L.) Walp.	Kacang panjang	Vegetable	Fruits	✓	✓
Gnetaceae	*Gnetum gnemon* L.	Melinjo	Vegetable	Leaves, Seeds	✓	✓
Lamiaceae	Mentha piperita L.	Leaves mint	Vegetable	Leaves	✓	-
	Ocimum sanctum L.	Kemangi	Vegetable	Leaves	✓	✓
Lauraceae	*Persea americana*	Alpukat	Fresh fruit	Fruits	✓	-
Malvaceae	*Durio zibethinus* Rumph. ex Murray.	Durian	Fresh fruit	Fruits	✓	-
Meliaceae	*Lansium parasiticum* (Osbeck) Sahni & Benne	Duku	Fresh fruit	Fruits	✓	-
Moraceae	*Artocarpus heterophyllus* Lamk.	Nangka	Fresh fruit, Vegetable	Fruits	✓	✓
Musaceae	*Musa paradisiaca* L.	Pisang	Fresh fruit	Leaves, Fruits	✓	✓
	Musa acuminate L.	Pisang kepok	Fresh fruit	Fruits	✓	✓
Myrtaceae	*Psidium guajava* L.	Jambu Seeds	Fresh fruit	Fruits	✓	✓
Myrtaceae	*Syzygium aqueum* (Burm.f.) Alston	Jambu air	Fresh fruit	Fruits	✓	✓
Oxalidaceae	*Averrhoa carambola* L.	Belimbing	Fresh fruit	Fruits	✓	-
Phyllanthaceae	*Sauropus androgynus* (L.) Merr.	Leaves katuk	Vegetable	Leaves	✓	-
Rosaceae	*Malus domestica* Borkh.	Apel	Fresh fruit	Fruits	✓	✓

	Pyrus nivalis Jacq.	Pir	Fresh fruit	Fruits	✓	✓
	Fragaria ananassa Duchesne.	Strawberry	Fresh fruit	Fruits	✓	✓
Rutaceae	*Citrus sinensis* (L.) Osbeck.	Jeruk manis	Fresh fruit	Fruits	✓	✓
	Citrus reticulate Blanco.	Jeruk mandarin	Fresh fruit	Fruits	✓	-
	Citrus limon (L.) Burm.f.	Lemon	Fresh fruit	Fruits	✓	✓
Sapindaceae	*Dimocarpus longan* Lour.	Lengkeng	Fresh fruit	Fruits	✓	-
Sapotaceae	*Manilkara zapota* (L.) P. Royen.	Sawo	Fresh fruit	Fruits	✓	-
Solanaceae	*Solanum melongena* L.	Terong	Vegetable	Fruits	✓	✓
	Solanum lycopersicum L.	Tomat	Vegetable	Fruits	✓	✓
	Solanum nigrum L.	Leunca	Vegetable	Fruits	✓	-
Vitaceae	*Vitis vinifera* L.	Anggur	Fresh fruit	Fruits	✓	-

TM (Traditional Market); MM (Modern Market)

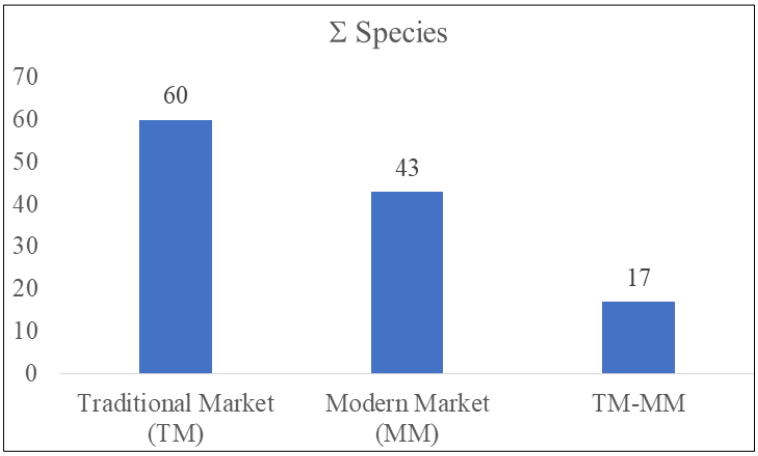

Figure 3 Number of plants for vegetables and fruit fresh that are traded in the traditional and modern markets of Harapan Indah, Bekasi, West Java

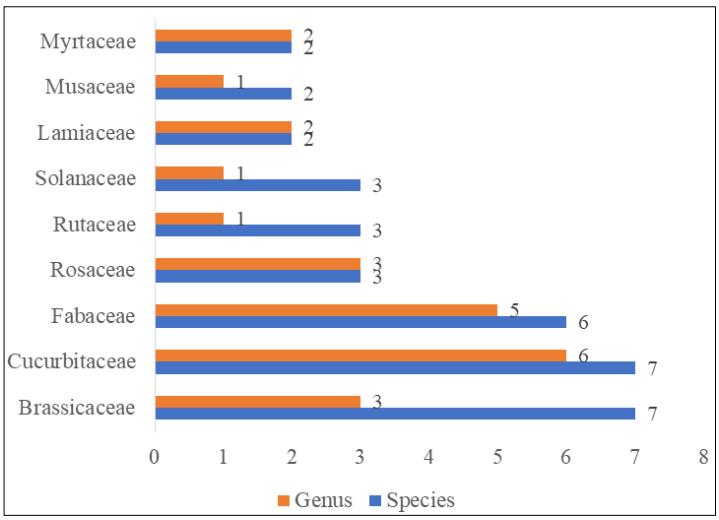

Figure 4 The family with the highest number of species traded as vegetables and fruits in the traditional and modern markets of Harapan Indah, Bekasi, West Java

The vegetables traded are dominated by Brassicaceae (7 species), Cucurbitaceae (7 species) and Fabaceae (5 species) (Figure 4). Brassicaceae such as cabbage, mustard greens and chicory are vegetables that are commonly used by various local communities in Indonesia and have been cultivated for a long time. Empirically, it can also be seen that green mustard is widely cultivated in the buffer zone of the city of Bekasi, especially on vacant lands. Several species of Fabaceae that are used as vegetables include long beans, green beans and bean sprouts.

Figure 5 shows that fruit organs (40 species) and leaves (18 species) are the most widely used parts, while the rest are stems, tubers, flowers and sprouts. Carrot and radish tubers are used as vegetables, while yam tubers tend to be used as "fresh fruit" ingredients because they are consumed without being processed first. The seed organ only belonging of *Gnetum gnemon* which is used as a vegetable.

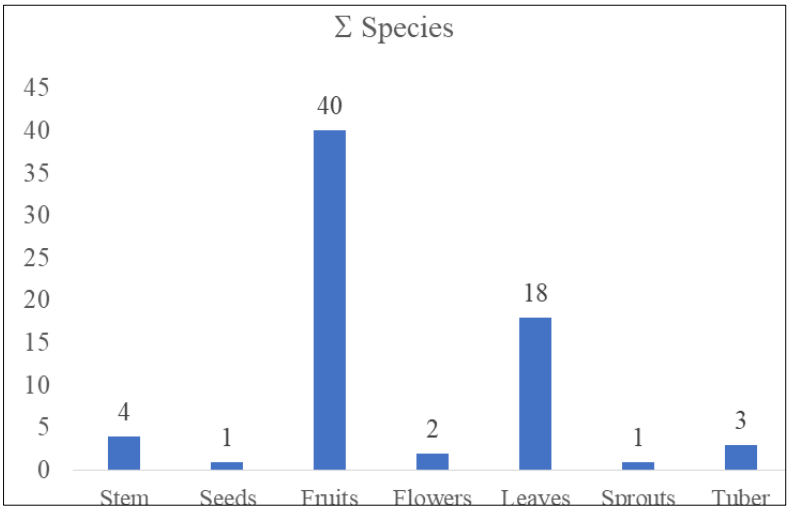

Figure 5 Diversity of parts as vegetables and fruit fresh that are traded in the traditional market and the modern market of Harapan Indah, Bekasi, West Java

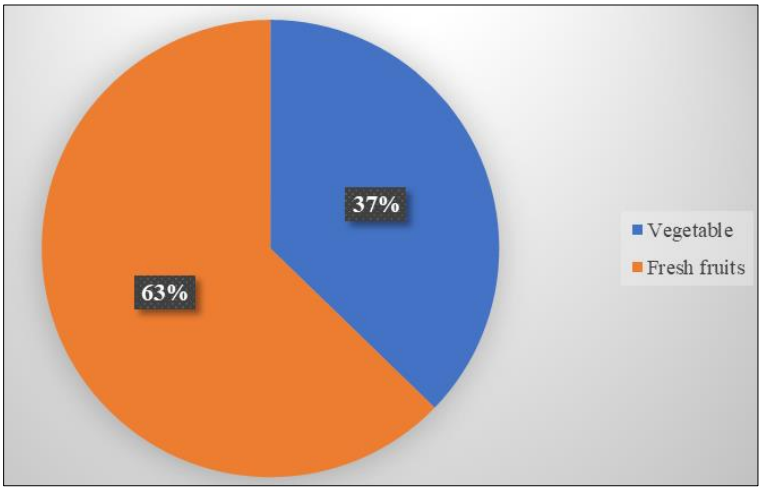

Figure 6 Percentage of vegetables and fruit traded in the traditional and modern markets of Harapan Indah, Bekasi, West Java

The relatively easy way of processing (stir-fry, boil and fresh vegetables) makes consumers like it. For example, green mustard leaves are an additional ingredient in the manufacture of various noodle foods such as meatball noodles, fried noodles, and boiled noodles. Some vegetables that are traded are often used as vegetables or consumed in fresh form (without being processed first or *lalaban*) such as *petai* (*Parkia speciosa*), eggplant, *kenikir* (*Cosmos caudatus*), basil, lettuce and cabbage. The *lalaban* is one of the Sundanese ethnic customs which is an ethnic group that is commonly found in the Bekasi area. The plants used as *lalaban* have a crunchy and soft texture so they are easy to chew when

eating. The *kenikir*, *petai* and basil are vegetables with an aroma that arouses the appetite so that it adds to the taste of the food. Some vegetables that are traded must be processed first before being consumed by boiling, sauteing or other preparations. The purpose of cooking vegetables is to change the texture to become softer as well as to kill pathogenic microorganisms and improve the taste. Some of them are cassava (*Manihot esculenta*) leaves, cabbage, *oyong* (*Luffa acutangular*), and *Ipomoea aquatica*.

Figure 6 shows that the types of sources of fresh fruit that are traded in the Harapan Indah market in Bekasi are much less (37%) than the types of vegetables (67%). Most of the fruits traded are tropical fruits or local fruits such as manga, mangosteen, banana, *Salacca zalacca*, durian and *Lansium parasiticum*. Some of these fruits are seasonal fruits such as mangosteen, manga, and *Lansium parasiticum*. so they are only found in certain months. The variety of manga traded varies with the local names of sweet fragrant mango, *Indramayu* mango, and *cengkir* mango with selling prices that vary from 15,000 to 30,000 IDR depending on supply.

3.2. Potential of Melinjo (*Gnetum gnemon*) and Jackfruit (*Artocarpus heterophylus*)

Some vegetable that are traded in the Harapan Indah market, Bekasi have the potential to be developed so that one of the efforts is to preserve local wisdom such as *Gnetum gnemon* and *Artocarpus heterophylus*.

3.2.1. Gnetum gnemon

Empirically, *G. gnemon* (Figure 7) is a plant that is easily found in the surrounding environment. This plant is often used as a shade on the side of the road and is also planted in vacant land. Various types of local food use *melinjo* leaves and strobilus as raw materials, namely *sayur asem* (like vegetable soup) and *lodeh* (like curry) vegetables. The young *G. gnemon* seeds are used as an ingredient for tamarind vegetables, while the old seeds are used as chips. The old seed coat is processed into stir-fried vegetables. This shows a close relationship between the local community and the *G. gnemon*.

Figure 7 The young leaves and young seeds of *Gnetum gnemon* used as vegetable ingredients

Based on our literature review, it turns out that *G. gnemon* is a vegetable that is rich in nutritional value and has properties for traditional medicine, so it has the potential to be developed as a nutraceutical. Seeds of *G. gnemon* contain bioactive compounds in the form of protein and stibelbenoids. *G. gnemon* seed coat contains stilbene derivatives (isorhapontigenin, resveratrol, gnetin D, gnetifolin K, gnetol), lignan compounds ((+) - lirioresinol B) [9] and is very rich in resveratrol dimers such as gnetin C and glucosides, gnemonoside A and gnemonoside D, trans-resveratrol, glucoside and trans-piceid [10]. Several types of protein have also been isolated from *melinjo* seeds, namely Gg-PHB [11], Gg-AOPI and Gg-AOPII [12]. The protein contained in *melinjo* seeds has antioxidant activity [12] and anti-hypertensive [11,13].

The young and old leaves, seed coat and endosperm of *melinjo* have activity to inhibit DNA damage. The mature leaves of *G. gnemon* contain high levels of antioxidants, followed by the young leaves. Mature and young leaves have the highest antioxidant components and DNA damage prevention activities. Endosperm had significant activity in ORAC, peroxyl radical scavenging activity and DNA damage prevention activity were concentrated at higher concentrations [14] (Santoso et al 2010). Prenylated stilbene *G. gnemon* showed a comparable antioxidant effect and was slightly lower than the structure of natural stilbene [9]. The protein contained in *G. gnemon* seeds has antioxidant activity [12] and anti-hypertensive [11,13]. Protein isolated from *G. gnemon* seeds has activity as an antihypertensive because it has activity

as an ACE inhibitor. Anti-hypercholesterolemic activity of *G. gnemon* seed extract through inhibition of HMG-CoA reductase activity [15] (or by lowering triglycerides by oxidizing low density lipoprotein (LDL) cholesterol and modulating lipid metabolism [16].

3.2.2. Artocarpus heterophyllus

The *A. heterophyllus* is a multifunctional plant. The ripe jackfruit is used as a source of fresh fruit, while the young fruit (Figure 8) is used as a vegetable ingredient. The Javanese ethnic in the surrounding environment, process young fruit into *gudeg* (processed young fruit with various spices until soft and dark brown in color without sauce). In addition, young fruit can also be processed into curry which is used as the main ingredient in serving vegetable *lontong* (like rice cake curry), but the processing varies greatly from one trader to another as well as between ethnic groups.

Figure 8 The young fruit of *Artocarpus heterophyllus* used as a vegetable

The use of jackfruit as a vegetable is related to its nutritional content. Ocloo et al [17] reported that jackfruit seeds are rich in protein (13.5%), carbohydrates (79.34%) and minerals such as calcium, iron, potassium, sodium, copper and manganese. Besides being rich in nutrients, it turns out that jackfruit is rich in secondary metabolite compounds so that it can be developed as traditional medicine. Jackfruit contains cycloartocarpin, artocarpin, artocarpanone, and cyanomaclurin compounds which have anti-bacterial activity [19]. Phytochemical screening confirmed the presence of phytosterols, anthraquinones, terpenoids, phenols, glycosides, flavonoids and diterpenes in jackfruit [19]. Ethyl acetate extract showed the strongest antibacterial activity against *Streptococcus mutans, S. pyogenes, Pseudomonas aeruginosa* and *Bacillus subtilis* with minimum inhibitory concentration (MIC) values of 78, 39, and 9.8 mg/mL, respectively [18]. The activity of jackfruit as an antimicrobial has the potential to be developed as a natural food preservative. Empirically, it also looks like *gudek* has a longer shelf life compared to other types of vegetables.

Ethanol extract of the bark of *A. heterophyllus* has antioxidant activity in vitro [20,21]. The bioactivity of plants as antioxidants is often associated with the content of phenolic compounds [21] and their polyphenols [22]. Administration of ethanolic or n-butanol extracts of *A. heterophyllus* to streptozotocin-treated diabetic rats significantly reduced fasting blood glucose from 200 to 56 and 79 mg%, respectively. In addition, ethanol extract or n-butanol increased insulin levels from 10.8 to 19.5 and 15.1 U/ml, respectively [23]. Two new chalcones, artocarpusins A and B, one flavone in the form of artocarpusin C, one new 2-arylbenzofuran derivative, artocarstilene A, and 15 flavonoids have been isolated from twigs of *A. heterophyllus*. Several isolated flavonoid compounds showed moderate inhibitory activity on the proliferation of PC-3 and H460 cell lines [24].

4. Conclusion

A total 60 species of fresh vegetable and fruit have been sold in traditional markets and only 43 species in modern markets in the Harapan Indah, Bekasi, and West Java. Most of the plants belonging Brassicaceae (7 species), Cucurbitaceae (7 species) and Fabaceae (6 species). The part used was dominated fruit (40 species) and followed leaves (18 species).

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest.

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