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Submission date: 12-Jun-2021 08:48AM (UTC+0800)

Submission ID: 1604985662

File name: IRJMETS589372.pdf (1.34M)

Word count: 4062

Character count: 23181

LOCAL TUBERS DIVERSITY IN JEMBER DISTRICT AS A SUPPORT OF FOOD SECURITY DURING THE COVID-19 PANDEMIC

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ABSTRACT

Local food resources in the archipelago are very diverse, including serelia, various tubers, fruit and sago. Local tubers contribute to the availability of foodstuffs in the regions. Apart from being a source of energy, local food also contains high dietary fiber, antioxidants, vitamins and minerals. The impact of the Covid-19 pandemic has resulted in a food crisis. This is the right time to collect information about local tubers in Jember District, which is a database that needs to be introduced to the millennial generation. Furthermore, local food production, processing and consumption can be increased. This study aims to determine the diversity of local tubers in Jember District. The research method uses an exploratory survey, which aims to collect information using a qualitative approach. The area consists of 6 sub-districts, namely: Pasa, Patrang, Panti, Mayang, Kalisat, dan Pakusari. The results of this research found 13 types of tubers: cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), bote (*Colocasia affinis*), bental (*Colocasia esculenta*), black taro (*Colocasia fontanesii*), kimpul (*Xanthosoma sagittifolium*), gadung (*Dioscorea hispida*), arrowroot (*Marantha arundinacea*), ganyong (*Canna discolor* Lindl), gembili ketan (*Dioscorea esculenta* L.), uwi kelapa (*Dioscorea alata*), suweg (*Amorphophallus paeoniifolius*) and potato (*Solanum tuberosum* L.).

Keywords: Covid-19 Pandemic, Food Security, Jember District, Local Tubers.

I. INTRODUCTION

Local food is food that is consumed by local people in accordance with the potential of local wisdom. Local food commodities can be produced locally in the local community. Food security, according to the Food Law No. 18 of 2012, is the condition for the fulfillment of food for the state, for individuals, the availability of sufficient food, both in terms of quantity, quality, safety, diversity, nutrition, equitable and affordable, and does not conflict with religion, belief, community culture to be able to live healthy, active and productive in a sustainable manner. Local food resources in the archipelago are very diverse, ranging from cereals, various tubers, fruits and vegetables. However, their availability and use are still very limited. In fact, local food is healthy food because apart from being a source of energy, it also contains high food, antioxidants, beta carotene, anthocyanins, polyphenol, vitamins and minerals [1].

Food security can also be defined as a condition for the fulfillment of food for households, which is reflected in the availability of sufficient food (quantity and quality), safe, equitable and affordable [2]. In an effort to achieve national food security, among others, through food diversification, as well as proposing a food diversification program. Food diversification that is meant not to completely replace rice, but to change and improve people's consumption patterns so that there are more types of food with better nutritional quality [3].

Indonesia as a country with a tropical climate has considerable potential in the agricultural sector [4]. Various agricultural commodities are feasible enough to be developed in Indonesia, one of which is tubers. Tubers are

food ingredients that have a unique taste and good nutritional content, so they have the potential to be developed as an alternative food source [5].

Tubers have been known as foodstuffs for a long time by the people of Indonesia, including the people in Jember District. There has not been much disclosure of both the diversity of tubers and their uses which have their own characteristics. Tubers are traditional plants that have been known to the public for a long time as a source of food (carbohydrates) which can be relied on as supplements and supplements to the need for rice [6]. The result of the economic crisis since 1997 has changed the diet of the population as indicated by increasing consumption of cassava from 28.16 calories / capta / day in 1996 to 34.96 calories / capta / day in 1999. The potential of tubers as food can be sorted based on the point of view of biological potential and economic potential [7]. Biological potential is more related to various types and production capabilities, while economic potential is related to material constituents, availability, and processing as well as its relation to other materials [8]. Various types of tubers are found in Indonesia.

Regional potential in the agricultural sector in Jember District consists of the main foods including: rice, corn, soybeans, peanuts, sweet potatoes and cassava, while other food crops include fruit and vegetables. Jember District is an area that has abundant tubers. In Jember District, almost various types of root crops can be found and developed by the community. This tuber plant can be found in almost every district in Jember District. Several types of tuber crops are widely planted by the community in Jember District which have potential as food, however, only a few types of tubers have received special attention from the Department of Agriculture.

According to [9], tubers are the types of plants that have tubers, rhizome roots or layered tubers. Tubers are a change in the shape of a part of a plant in the form of a stem or root which becomes a swollen, round shape, like a cone or irregular which is a place to store food. Tubers are plants that are suitable to be developed to solve food problems and are also high economic value food plants that can bring benefits to processed food industry entrepreneurs, traders and farmers who cultivate them. Tubers have high nutritional value and are complete and can be used as an alternative food substitute for rice [10].

The Covid-19 pandemic that hit the world, caused a food crisis. Now is the right time to pay attention to local food, especially tubers. Starting from knowing the various types, how to plant, increasing production, processing, consuming and preserving local food. This study aims to determine the various types of tubers in Jember District, as an alternative food in Jember District during the Covid-19 pandemic.

II. METHODOLOGY

The research method uses descriptive and qualitative methods. The research instrument used observation sheets, interviews and documentation. Survey activities were carried out in March - April 2020. To obtain primary data, researchers directly took samples to markets by observing and looking for information about the distribution of tubers that were sold, then interviewing farmers in the Jember area. Meanwhile, secondary data is data obtained by researchers from existing sources and has been obtained by researchers from the Agriculture Office of Jember District.

Determination of tubers was carried out by interview which then identified the morphology of the tubers based on plant type, leaf edge, leaf edge color, tuber shape, cormus shape, flesh color, shoot color, root color, tuber weight. to obtain preliminary information about the types of tuber plants in Jember District. Secondary data were collected from tubers data from the Agriculture Office of Jember District and data from Disperindag (Department of Industry and Trade) of Jember District.

The location determination is based on the main market and first class market, where the main market is the Tanjung market, while the first class market consists of all the markets in Jember District according to data from the Department of Industry and Trade. Sampling in class one consisted of four Districts in the direction of the map of Jember District, namely in the north there is Sukowono District (Sukowono market), in the east there is Silo District (Silo market), south there is Ambulu District (Ambulu market), and west there is Kecamatan Tanggul (Pasar Tanggul) (Fig. 1). The location selection in the four Districts above is based on the location of the area.



Figure 1: Map of Jember District

III. RESULTS AND DISCUSSION

Tuber Diversity in Jember District as a Learning Source for Biology that Supports Food Security

Based on the results of research conducted in May 2020. The diversity of tubers found in markets in North and East Jember, namely the Tanjung market as a comparison market, Arjasa market, Panti market, Mayang market, Kalisat market and Pakusari market can be seen in Table 1.






Table 1. Potential Types of Tubers from Market Traders in 6 sub-Districts in Jember Districts






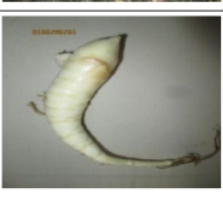

| No | North Jember Area | | | | | East Jember Area | | |
|------|--|--|--|--|--|--|--|--|
| | Type of tubers | Tanjung Market (comparison) | Arjasa Market | Panti Market | Patrang Market | Mayang Market | Kalisat Market | Pakusari Market |
| 1. a | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) | White Sweet Potatoes (Ipomoea batatas L.) |
| b | Purple Sweet Potatoes (Ipomoea batatas L.) | Purple Sweet Potatoes (Ipomoea batatas L.) | Purple Sweet Potatoes (Ipomoea batatas L.) | Purple Sweet Potatoes (Ipomoea batatas L.) | Purple Sweet Potatoes (Ipomoea batatas L.) | - | - | Purple Sweet Potatoes (Ipomoea batatas L.) |
| c | Yellow Sweet Potatoes (Ipomoea batatas L.) | Yellow Sweet Potatoes (Ipomoea batatas L.) | Yellow Sweet Potatoes (Ipomoea batatas L.) | - | - | Yellow Sweet Potatoes (Ipomoea batatas L.) | Yellow Sweet Potatoes (Ipomoea batatas L.) | - |
| d | Honey Sweet Potatoes (Ipomoea batatas L.) | Honey Sweet Potatoes (Ipomoea batatas L.) | - | - | - | - | - | - |





| | | | | | | | | |
|------|---|---|---|---|---|---|---|---|
| 2. a | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) | Eucalyptus Cassava (Manihot esculenta Crantz) |
| b | Yellow Cassava (Manihot esculenta Crantz) | Yellow Cassava (Manihot esculenta Crantz) | Yellow Cassava (Manihot esculenta Crantz) | - | - | - | Yellow Cassava (Manihot esculenta Crantz) | - |
| 3. | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) | Bote (Colocasia affinis) |
| 4. | Black Taro (Colocasia fontanesii) | - | - | - | - | - | - | - |
| 5. | Kimpul (Xanthosoma sagittifolium Schott) | - | - | - | - | - | - | - |
| 6. | Bentul (Colocasia esculenta) | Bentul (Colocasia esculenta) | - | - | - | - | Bentul (Colocasia esculenta) | - |
| 7. | Gadung (Dioscorea hispida) | - | - | - | - | - | - | - |
| 8. | Arrowroot (Marantha arrundacea) | - | Arrowroot (Marantha arrundacea) | - | - | - | - | - |
| 9. | Ganyong (Canna edulis ker) | - | Ganyong (Canna edulis ker) | - | - | - | - | - |
| 10. | Gembili Sticky Rice (Dioscorea esculenta L.) | - | - | - | - | - | - | - |
| 11 | Uwi Kelapa (Dioscorea alata L.) | Uwi Kelapa (Dioscorea alata L.) | - | - | - | - | - | - |

| | | | | | | | | |
|-------|-------------------------------------|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 12 | Suweg (Amorphophallus campanulatus) | Suweg (Amorphophallus campanulatus) | - | - | - | - | - | - |
| 13 | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) | Potato (Solanum tuberosum L.) |
| Total | 13 | 8 | 6 | 4 | 4 | 4 | 5 | 4 |

Table 2. Types of Tubers in North and East Jember District

| No | Type of tubers | Figure |
|-------|--|--|
| 1. a. | Eucalyptus Cassava (Manihot esculenta Crantz.) |  |
| b. | Yellow Cassava (Manihot esculenta Crantz.) |  |
| 2. a. | White Sweet Potatoes (Ipomoea batatas L.) |  |
| 2. b. | Yellow Sweet Potatoes (Ipomoea batatas L.) |  |
| c. | Purple Sweet Potatoes (Ipomoea batatas L.) |  |

| | | |
|----|--|--|
| 3. | Bote (<i>Colocasia affinis</i>) |  |
| 4. | Black Taro (<i>Colocasia fontanesii</i>) |  |
| 5. | Kimpul (<i>Xanthosoma sagittifolium</i> Schott) |  |
| 6. | Bentul (<i>Colocasia esculenta</i>) |  |
| 7. | Gadung (<i>Dioscorea hispida</i>) |  |
| 8. | Arrowroot (<i>Marantha arrundacea</i>) |  |
| 9. | Uwi Kelapa (<i>Dioscorea alata</i> L.) |  |

| | | |
|-----|--|---|
| 10. | Gembili Sticky Rice (<i>Dioscorea esculenta</i> L.) |  |
| 11 | Ganyong (<i>Canna edulis</i> ker) |  |
| 12. | Suweg (<i>Amorphophallus campanulatus</i>) |  |
| 13. | Potato (<i>Solanum tuberosum</i>) |  |

The potential number (kg) of tubers in the market from 6 sub-districts of North and East Jember region has the highest number of potential tubers, namely eucalyptus (*Manihot esculenta* Crantz) with a total total of 1,850 kg. The least potential number of tubers is canna (*Canna edulis* ker) with a total of 2 kg. Meanwhile, the potential amount of purple sweet potato (*Ipomoeabatas* L.) is 250 kg, the potential for yellow sweet potato (*Ipomoeabatas* L.) is 150 kg, yellow cassava (*Manihot esculenta* Crantz) is 300 kg, Bote (*Colocasia affinis*) is 930 kg, bentul (*Colocasia esculenta* as much as 150 kg, arrowroot (*Marantha arrundicea*) as much as 3 kg, ganyong (*Canna edulis* ker) as much as 2 kg and potato (*Solanum tuberosum* L.) 950 kg. The total number of potential types of tubers in 6 sub-districts of North and East Jember is 5,740 kg with 7 types of tubers and 3 variations of tubers based on their color including white sweet potato (*Ipomoeabatas* L.), purple sweet potato (*Ipomoeabatas* L.), yellow sweet potato (*Ipomoeabatas* L.), cassava (*Manihot esculenta* Crantz), yellow cassava (*Manihot esculenta* Crantz), bote (*Colocasia affinis*), bentul (*Colocasia esculenta*), arrowroot (*Marantha arrundicea*), canna (*Canna edulis* ker) and potato (*Solanum tuberosum* L.).

Benefits of Tubers

Based on the results of research on the types of tubers that have been found in markets in 6 sub-districts of the North Jember region including (Arjasa market, Panti market, Patrang market) and East Jember area including (Mayang market, Kalisat market, Pakusari market), the potential benefits of tubers are obtained. can be used as processed industrial products presented in Table 3.

Table 3. Benefit of Tubers

| No | Type of tubers | Benefits | Products |
|----|--|---------------|---|
| 1. | White Sweet Potatoes (<i>Ipomoeabatas</i> L.) | Food material | Chips, donuts, klepon, compote, steamed, fried, flour |
| | | Medicine | Diabetes, constipation |

| | | | |
|-----|---|---------------|---|
| 2. | Purple Sweet Potatoes (Ipomoeabatas L.) | Food material | Steamed, fried, chips, flour and ingredients as food color preparations (Zuraida and Yati, 2001). |
| | | Medicine | Diabetes, constipation |
| 3. | Yellow Sweet Potatoes (Ipomoeabatas L.) | Food material | Chips, donuts, klepon, compote, steamed, fried, flour |
| | | Medicine | Diabet, sembelit |
| 4. | Honey Sweet Potatoes (Ipomoeabatas L.) | Food material | Chips, donuts, klepon, compote, steamed, fried. |
| | | Medicine | Diabetes, constipation |
| 5. | Eucalyptus Cassava (Manihot esculenta Crantz) | Food material | Chips, tape, suwar-suwir, crackers, compote, utri, fried sweet potato, steamed sweet potato, roasted sweet potato, tapioca flour, alcohol making, ethanol |
| | | Medicine | Diabetes, constipation |
| 6. | Yellow Cassava (Manihot esculenta Crantz) | Food material | Chips, tape, suwar-suwir, crackers, compote, fried sweet potato, steamed sweet potato, roasted sweet potato, tapioca flour, alcohol making, ethanol |
| | | Medicine | Diabetes, constipation |
| 7. | Bote (Colocasia affinis) | Food material | The tubers are boiled / steamed. taro chips, wheat flour |
| | | Medicine | Traditional medicine, namely: rhizome root pulp for gout medicine, rhizome root liquid for ulcers, leaf sap to stop bleeding due to wounds and swelling medicine, fronds and roasted leaf stalks to reduce itching. |
| 8. | Black Taro (Colocasia fontanesii) | Food material | Steamed taro, liqueur, chips, flour (Minantyorini, 2002). |
| | | Medicine | Anti-swelling and can treat diarrhea |
| 9. | Kimpul (Xanthosoma sagittifolium Schott) | Food material | Boiled / steamed kimpul, getuk kimpul, cracker chips, flour, lunkhead. |
| | | Medicine | Taro root pulp is believed to be a medicine for gout; the liquid of rhizome root is used for ulcers; the sap of the leaves is often used to stop bleeding due to wounds and swelling drugs. The fronds and leaf stalks that have been roasted can be used to reduce itching, even the leaf midrib can also be used as a scorpion bite medicine. |
| 10. | Bentul (Xanthosoma) | Food material | Steamed, chips, flour. |

| | | | |
|-----|--|---------------|---|
| | sagittifolium) | Medicine | Overcoming digestive problems, overcoming high blood problems, helping vision problems, healthy skin and hair, as a booster for the immune system and blood flow, good for diabetics (Akwee, 2015). |
| 11. | Gadung (<i>Dioscorea hispida</i> Densst) | Food material | Chips and flour (Richana, 2012). |
| 12. | Arrowroot (<i>Maranta arundinacea</i>) | Food material | Steamed, arrowroot flour, chips, bangkiak cake |
| | | Medicine | Wound healing drugs, cool the stomach and dysentery, eczema drugs (Titiek et al, 2010) |
| 13. | Ganyong (<i>Canna edulis</i> Ker.) | Food material | Steamed, chips, flour (Richana and Titi, 2004). |
| | | Medicine | Heartburn, urinary tract inflammation, diet |
| 14. | Gembili Sticky Rice (<i>Dioscorea esculenta</i> L.) | Food material | Steamed, chips, flour. |
| | | Medicine | Constipation drugs, cholesterol drugs (Prabowo et al, 2014) |
| 15. | Uwi Kelapa (<i>Dioscorea alata</i> L.) | Food material | Steamed, chips, flour. (Richana and Titi, 2004). |
| | | Medicine | Oral contraceptives, sex hormones, Kartiko steroids |
| 16. | Suweg (<i>Amorphophallus paeonifolus</i>) | Food material | Steamed, starch (Richana and Titi, 2004). |
| | | Medicine | In the pharmaceutical field: as a binder for tablet formulations, a thickener for medicinal syrups, a waterproof wrapper and bond, a tablet desintegrator, for the manufacture of suppositories |
| 17 | Potato (<i>Solanum tuberosum</i> L.) | Food material | Steamed, fried, vegetables, flour, chips, raw materials for making cakes |

Diversity of tubers species found from market traders in 6 sub-districts of North and East Jember.

The diversity of tuber types that have been found in six markets and added with one market as a comparison market of the six research markets located in the six sub-districts of North and East Jember is mostly found in Pasar Tanjung or as a comparison market in Kaliwates District as much as 20% or There are 7 types of tubers, while of the six research markets that occupy the highest number, are found in the Arjasa market in Arjasa District with 17% or 6 types of tubers, the second is the Kalisat market in Kalisat District with 15% or 5 types of tubers, third namely the Pantl market in Pantl District, the Patrang market in Patrang District, the Mayang market in Mayang District and the Pakusari market in Pakusari District, which have the same percentage - a little, namely 12% or 4 types of tubers. (Fig. 2).

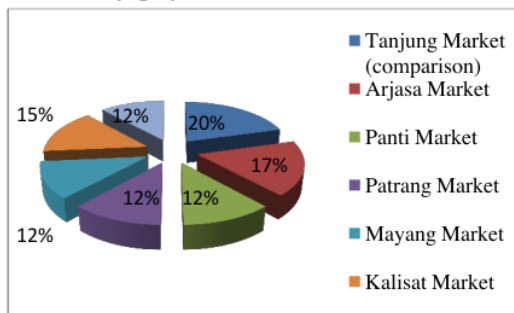


Figure 2: Percentage of Tuber Diversity in Market Traders in 6 sub-Districts of North and East Jember.

Diversity Place of Origin of Tubers Sold in Markets From 6 sub-Districts.

Based on Figure 3, of the 13 types of tubers that have been found from market traders in 6 sub-districts of the North Jember region including Arjasa market, Patrang market, Panti market and East Jember area including Mayang market, Kalisat market, Pakusari market, it can be seen that the potential origin of the tubers sold traders obtained from Jember and outside Jember. The percentage comparison of these types of tubers that mostly came from Jember, namely white sweet potatoes, eucalyptus cassava and bote, was 22%, while the highest percentage yield came from outside Jember, namely potatoes 28%.

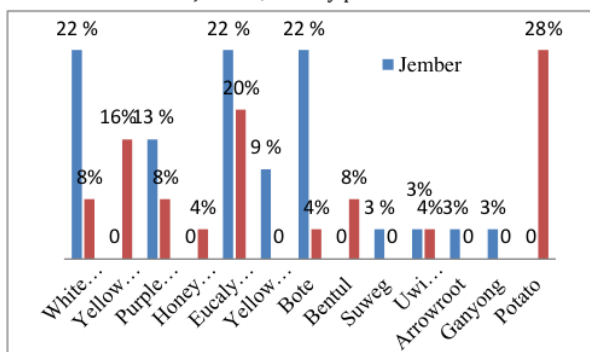


Figure 3: Percentage of Tuber Diversity in Market Traders in 6 sub-Districts of North and East Jember.

The number (kg) of tubers sold by Market Traders in 6 Districts of North and East Jember Region.

Percentage of tubers that are mostly found in market traders from 6 sub-Districts of North and East Jember, namely eucalyptus with a percentage of 32% (Fig. 4), these types of tubers are found in six markets, namely Arjasa market, Panti market, market Patrang, Kalisat market, Mayang market, Pakusari market and even other markets are always available, according to the information obtained that cassava is a side planting cultivation in farmers' fields or yards and many people like cassava as processed food such as steamed, made chips, getuk, etc.

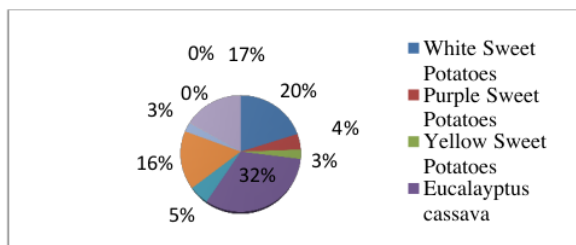


Figure 4: The number (kg) of tubers sold by Market Traders in 6 sub-Districts of North and East Jember.

Tuber Traders in the Market from 6 Districts of North and East Jember Region.

Tuber traders in the market from 6 sub-districts of North and East Jember region, of the 13 types of tubers that have the highest percentage of potential traders, namely 25% potato traders, while those with a small percentage of potential traders are 1% arrowroot traders, 1% bentul and 0% ganyong. . White sweet potatoes have a potential merchant percentage of 18%. Purple sweet potato has a 5% percentage of potential traders, Yellow sweet potato has a 3% percentage of potential traders. Eucalyptus cassava has a potential percentage of traders of 22%. Yellow cassava has a potential percentage of 4% traders. Bote has a potential percentage of traders of 21%. Bentul and arrowroot have the same percentage of potential traders, namely 1%. Ganyong has a percentage of only 0% potential traders. Potatoes have a 25% percentage of potential traders (Fig. 5). The diversity of tubers found can be developed as local food ingredients that can be used during the Covid-19 pandemic.

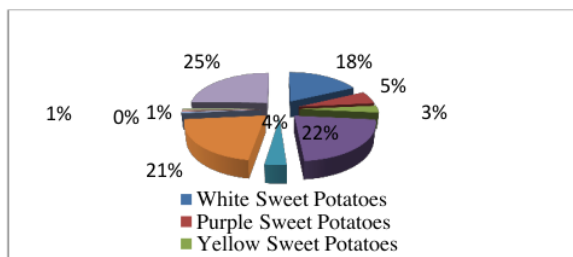


Figure 5: Percentage of Bulbs Traders in Markets From 6 sub-Districts of North and East Jember.

IV. CONCLUSION

There are 13 types of tuber plant species, namely sweet potatoes, types of sweet potatoes, there are 4 color variations including white sweet potato, purple sweet potato, yellow sweet potato and honey sweet potato, then cassava tubers there are also 2 tuber color variations, namely eucalyptus and cassava. yellow cassava, bote, black taro, kimpul, bentul, gadung, arrowroot, ganyong, gembili sticky rice, uwi coconut, suweg and potatoes. The diversity of tubers found can be developed as local food ingredients that can be used during the Covid-19 pandemic.

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