
A comparative assessment of marita (*Pandanus conoideus*) production challenges and opportunities for further research and development in Papua New Guinea – A Review

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Abstract: Despite being a high-value native crop, marita (*P. conoideus*) has received little research and development attention in Papua New Guinea (PNG). Studies in Indonesia have confirmed that marita oil contains natural antioxidants, including carotenoids, tocopherol, omega-3 and omega-6 fatty acids, and anti-inflammatory properties beneficial to human health. In PNG, the marita holds cultural significance and economic value as it is used in traditional rituals, bride price payments, and barter systems as a special gift, and it serves as a source of income for many families. The literature further shows that most information is on background, especially distribution, cultural significance, and food sources like oil and sauce. Unpublished reports in PNG show twenty-four varieties were found in Lumi, West Sepik Province, eighteen different accessions in Jiwaka Province, and four in the Nipa- Kutubu area in the Southern Highlands Province (SHP). This shows that a diversity of marita exists in PNG, and studies need to be conducted on agronomic practices, nutritional and chemical compositions, molecular diversity analysis, and pest and disease management. This study aims to establish that marita is an underutilized crop in PNG, and there is a need to study diversity nationwide, its socio-economic, cultural, and nutritional importance, and wider cultivation as an alternative crop under climate change.

Key words: Marita, research, cultivars, morphology, nutritional properties.

Main author biography: I, Mr. Jonah Anton, who graduated from PNG University of Technology (Unitech) with a Bachelor of Science in Agriculture in 2013. I joined the National Agriculture Research Institute in 2014 and worked as a crop agronomist until I left for my postgraduate at Unitech this year, 2025. I'm currently studying Master of Philosophy in Agriculture at PNG Unitech.

1. INTRODUCTION

Marita (*Pandanus conoideus*) is a tropical plant and is one of the *Pandanus* species (Stone, 1997). *Pandanus* is a complex genus with 600–700 species identified across the Pacific islands, Malaysia, and Australia (Wagner *et al.*, 1990; Jong and Chau, 1998). Rhoman *et al.* (2011) and Sarungallo *et al.* (2019) asserted that *P. conoideus* is an indigenous crop originating from Papua New Guinea (PNG) and Indonesia. Bourke (2009) stated that marita is grown and consumed by around 1.5 million people in PNG, mainly in the Highlands and Momase Regions, along with Manus, Central and West New Britain provinces.

The marita fruit is utilized as a food supplement with its rich oil content as well as a natural dye, and as a natural remedy for various diseases by the people of the Highlands provinces of PNG (National Newspaper, 22/02/2025). Bourke (2005) stated that the sauce or oil derived from marita is utilized to enhance the flavour of other foods, such as sweet potato, banana, and green vegetables. The crop is able to withstand drought conditions,

making it a valuable food source, flavouring indigenous bush vegetables like Kumu Musong (*Ficus kopiosa*), Fern (*Cyathea spp.*), and highlands Kapiak (*Ficus dammaropsis*) for consumption during adverse periods (Anton *et al.*, 2018). The marita fruit has also been employed in traditional rituals, bride price payments, barter systems, and is regarded as a special gift. Recently, some entrepreneurs have utilized marita to produce herbal medicine for treating diseases, and soap is made from its oil and sold in informal street markets in Goroka and Mt. Hagen (Post Courier-news, 22/02/2025). Figure 1 below shows some of the marita-based products such as soap, oil, and animals' feeds that were displayed during the Jimi Marita Festival show at Karap in Jiwaka Province and processed oil sold at Goroka in the Eastern Highlands Province. Several studies conducted in Indonesia confirmed that marita is a highly nutritious crop containing chemical compounds that provide significant health benefits (Mun'im *et al.*, 2006).

Despite its benefits and significance in society, research on this native crop has been overlooked in PNG. In contrast, Indonesia has conducted extensive research, focusing on characterization, agronomy, nutrition, and molecular studies, which led to product development and export to other countries. This literature is focused on reviewing marita's research in PNG to consolidate and validate information to identify opportunities for further research and development. The review focuses on marita's origin, distribution, production constraints, and physical, chemical, and molecular characterizations.



Figure 1: The oil, cream, soap, and animal feed derived from marita sold locally in the Highlands of PNG.

2. ORIGIN AND DOMESTICATION

According to Jong and Chau (1998), marita is endemic to New Guinea inland in the Pacific region. Rhoman *et al.* (2011) and Sarungallo *et al.* (2019) reported that marita is an indigenous crop that originated from the Highlands and Momase regions of PNG as well as the Papua and West Papua provinces of Indonesia. In Indonesia, marita is limited to all the mainland districts of Papua and West Papua territories at altitude ranging from 50 to 2000 meters above sea level (masl) (Lim, 2012; Murtiningrum *et al.*, 2012). The regions of West Papua and Papua are home to about thirty-nine different types of red fruit, four of which are highly valuable economically: (1) red long fruit, (2) red short fruit, (3) red-brown fruit, and (4) yellow fruit (Xia *et al.*, 2018). According to Bourke (2005), marita is present in all mainland provinces of PNG, but especially in the Momase and Highlands Regions, as well as in Manus, West New Britain, and Central Provinces (Figure 3). Marita is cultivated for consumption, traditional rituals, and sales for income generation.

3. BOTANY, VEGETATIVE GROWTH, AND REPRODUCTIVE DEVELOPMENT

Marita is a tree plant species scientifically known as *Pandanus conoideus* in the Pandanaceae family. In PNG, *P. conoideus* is commonly referred to as "Marita" in Tok Pisin, whereas in Indonesia, it is known as "Buah merah," which literally means "red fruit" (Stone 1997). The stem height of the marita plant can reach heights of 2 to 12 m,

with trunk diameters ranging from 30 to 70 cm (Kerepea *et al.*, 2025). The trunk is typically dark brown with white patches and grows vertically with 2 to 6 branches, featuring spiny surfaces (Figure 2). The plant begins to produce fruit between 1.5 and 3 years-of-age, with each fruiting period lasting approximately 3 to 4 months. The tree is considered old at 20 to 30 years of age (Martiningrum *et al.*, 2012). Marita has a taproot system, with the main root length ranging from 0.2 to 3.5 m and a root circumference of 6 to 20 cm (Kerepea *et al.*, 2025). Leaves are formed at the tips of branches in opposite arrangements, measuring between 100 and 250 cm in length and 10 to 20 cm in width (Thomson *et al.*, 2006). They are flexible, dark green, lined with thorns along the edges and lack petioles (Hyndman, 1984).

The fruit is a drupa, formed from the fusion of multiple flowers into a compound fruit. The length of the drupa ranged from 1.2 to 1.8 cm and shape varies from triangular to cylindrical (Table 1) with a rounded tip and a heart-shaped base, measuring length ranges from 30 to 110 cm and diameter from 10 to 15 cm (Kerepea *et al.*, 2025; Murtiningrum *et al.*, 2012). Kerepea *et al.* (2025) further reported that the fruit color of marita changes from pale red to brick red as it matures. However, this varies with cultivar; for example, *Kukang* from Jiwaka turns from green to orange, while *Pengie Yol* and *Wurum* transition from pale red to brick red at maturity. Marita is a seasonal crop, with its main harvesting season running from October to April, although individual trees may bear fruit year-round (Bourke and Harwood, 2009).

In PNG, marita is commonly propagated using vegetative buds or suckers, as the seeds exhibit low vigor and poor germination rate (Sadsoeitoeboen, 1999; Makaruku, 2008; Sianipar, 2016) stated that seed germination is inhibited by a surrounding tissue that acts as a barrier to embryo growth. Vegetative suckers are selected from desirable varieties and planted in a prepared field.

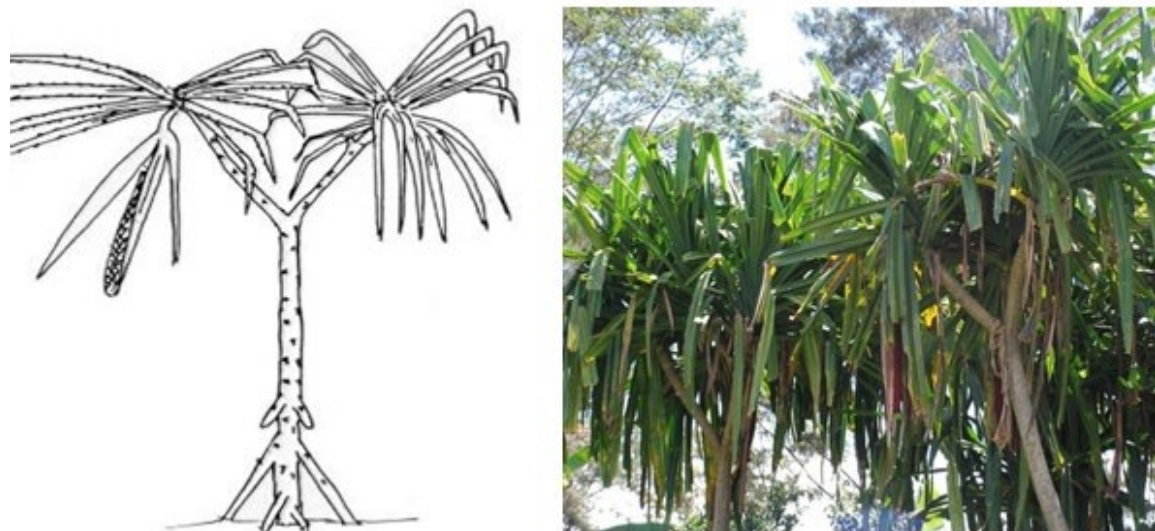


Figure 2: Images of the *P. conoideus* plant (sourced from google website).

4. DISTRIBUTION AND PRODUCTION

4.1. Marita distribution and production in Papua New Guinea

Marita is widely distributed across provinces in the Highlands and Momase regions, and other parts of PNG (Kambuou, 1996; Rhoman *et al.*, 2011; Bourke, 2009). Based on personal observations and discussions with local farmers, Marita is domesticated in several districts of the highlands region, including Tari-Pori, Koroba-Kopiago, and Komo-Magarima in Hela province; all districts of the Southern Highlands Province (SHP) except Upper-Mendi and parts of the Imbongu district; and throughout the Western Highlands Province (WHP) except for Tambul and Tomba in the Tambul- Nebilyer district. In Enga Province, marita is cultivated in Kompam-Ambum, Wapenamanda, and parts of Wabag district, while it is also present across Jiwaka, Simbu, and Eastern Highlands Provinces (EHP). Marita has also been identified in high-altitude areas of West and East Sepik Provinces, part of Madang province, as well as Kabwum, Finschhafen, Bulolo, Menyamya, and Wau-Waria districts of Morobe

Province. Additionally, it is cultivated in some parts of Manus, East and West New Britain, Central, Milne Bay, Oro, Gulf, and Western Provinces (Bourke 2009: Figure 3).

In personal communication with Pandau, a NARI Plant Genetic Resource Technical Officer, on 23rd of December 2024, he identified approximately 24 distinct cultivars from Lumi in West Sepik Province. Furthermore, around 18 distinct cultivars were displayed during the Jimi Marita Festival at Karap in Jiwaka Province (National Newspaper, 23/01/2025), and four were previously identified by Sillitoe (1983) in Nipa, SHP. This suggests that numerous provinces across the Highlands and Momase regions possess unique marita accessions. Marita is typically cultivated along mountain slopes, riverbanks, land boundaries, and marginal areas within garden fields (Bourke and Harwood, 2009). Farmers also noted the absence of structured agronomic practices, such as fertilizer application, pruning, weeding, and pest and disease management practices. These observations are based solely on verbal accounts, as no formal studies have been published in the PNG context.

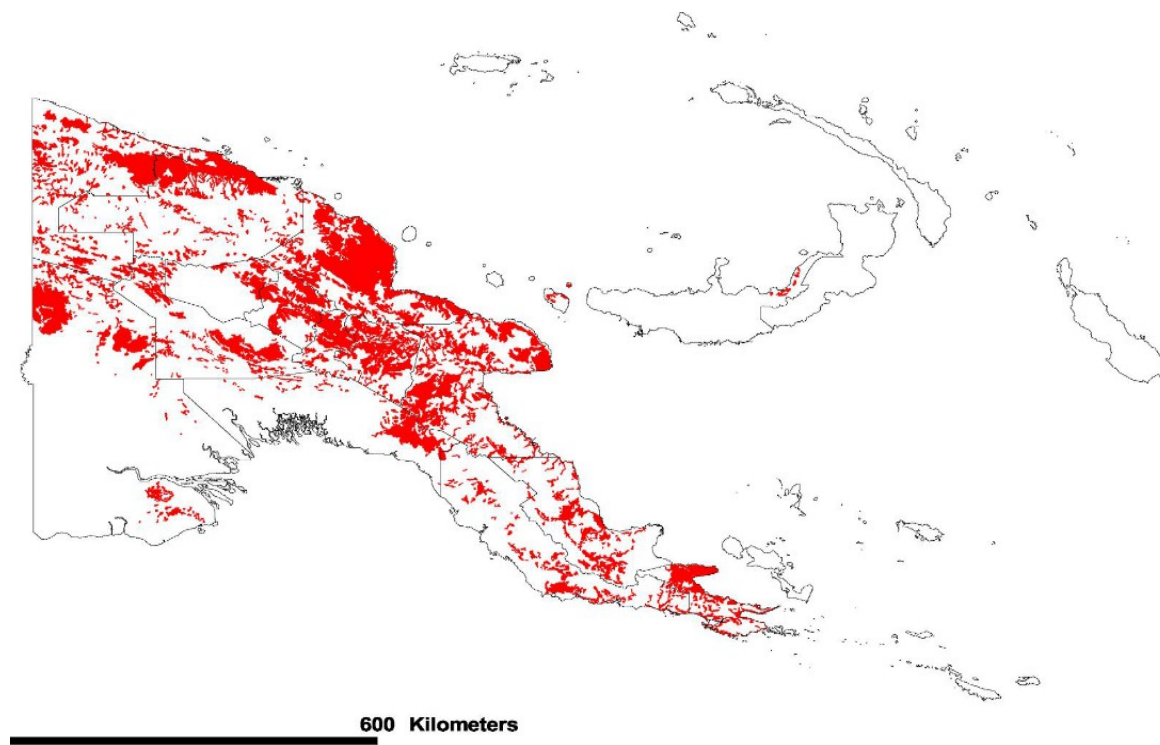


Figure 3: Distribution of *marita* in PNG. Source: Bourke (2009) and MASP database.

4.2. Other places

According to Murtiningrum *et al.* (2012) and Rhoman *et al.* (2011), marita is geographically restricted to the West Papua and Papua Provinces of Indonesia. These regions and PNG are all located on the island of New Guinea, which is the only known natural habitat of marita. It is a native crop, traditionally cultivated and passed down through generations. It thrives particularly on gentle to steep slopes, along the hillsides, riverbanks, and roadsides, despite the absence of proper agronomic management. Farming practices are largely traditional, inherited through generations, and are often carried out without support from agricultural extension services.

5. PRODUCTION CONSTRAINTS

5.1 Ecology (environment and climate)

Several research studies have indicated that marita is a unique fruit crop well adapted to a wide range of ecological conditions in PNG, particularly between 50 to 2,000 masl (Stone, 1997; Bourke, 2009). It thrives in moist

environments, often under shade with a pH ranging from 4.5 to 6 and distributed in areas with moderate to high rainfall (Bourke, 2005). However, marita is restricted in its adaptability to certain soil types and climates. It does not perform well in swampy environments, heavily waterlogged, clay, dry, sandy soils (Makaruku *et al.*, 2021). Similarly, the crop is sensitive to high temperatures (27- 30 °C), altitudes below 20 masl (typically coastal areas), and elevations above 2,000 masl (Bourke, 2009). For instance, Tomba/Tambul in WHP, Upper Mendi in SHP, and Gembogl in Simbu Provinces are located above 2,000 masl and are not conducive for marita cultivation.

5.2. Pests and Insects

Insects and birds are commonly reported as pests affecting marita crop. Ripe marita fruits attract birds, including birds of paradise, which feed on the juice and pulp, causing significant damage (personal comm.). Makaruku *et al.* (2021) documented several insect pests affecting marita in West Papua, including the longhorn grasshopper (*Tettigoniidae*), banana scab moth (*Nacoleia octasema*), and stem borers (*Chilo partellus*). In PNG, the specific pests and insects affecting marita remain largely undocumented. However, Highland farmers during the Jimi Marita Festival reported the damage caused by birds, bark beetles (*Scolytinae*), borer tunnels, and longhorn grasshoppers. This highlighted the urgent need for formal investigations and documentation of pest species associated with marita cultivation in PNG.

5.3. Diseases

Bourke (2010), in his review of fruits and nuts in PNG, highlighted several studies on pests and diseases but found limited information specifically relating to marita. One documented disease affecting marita in Morobe Province is caused by *Erwinia carotovora subsp.* which leads to fruit rot and leaf necrosis (Tomlinson, 1988). Biochemical, physiological, and pathogenic tests confirmed *E. carotovora* as the causative agent affecting the leaves. Tomlinson (1988) also identified black leaf mold fungus and leaf spot as common problems, sometimes resulting in fruit becoming soft, squashy, and malodorous when immature. Infected fruits are often shed prematurely and left to decay due to yellow mottle symptoms. Despite these findings, overall knowledge of marita's diseases remains limited. Tomlinson remains the only researcher to have studied marita's pest and disease problems in detail in Indonesia and PNG.

6. SYNTHESIS OF PAST RESEARCH

6.1 Morphological Characterization

Zebua *et al.* (2019) stated that Indonesia possesses nearly 39 diverse marita accessions that have been identified and documented. These accessions were characterized based on both morphological and chemical traits (Kerepea *et al.*, 2025; Murtiningrum *et al.*, 2012). The morphological characterization included the origin and local name of the accession, core structure, fruit flesh color, fruit length, and length of dupra. Murtiningrum *et al.* (2012) characterized 16 cultivars from Papua in Indonesia and the results is presented in Table 1 below. The 16 cultivars have a triangular core shape, red color except for two cultivars with a dark-red color, fruit length ranges from 21 to 76 cm, and drupa length ranges from 1.2 to 1.8 cm. Kerepea *et al.* (2025), in a separate study, reported that the marita fruit's length ranges from 30 to 110 cm and 10 to 15 cm in diameter and the fruit shape may be cylindrical or triangular with a blunt tip and a heart-shaped base. In some studies, additional plant features were assessed, such as plant height, leaf color, leaf size, fruit size, fruit weight, and branch characteristics (Sianipar and Santosa, 2016). Hyndman (1984) noted that the plant can reach heights of up to 11 meters with a trunk diameter of 20 to 50 cm. The leaf's length ranges from 100 to 250 cm and 10 to 20 cm in width (Kerepea *et al.*, 2025).

The physiological character differences in fruits, leaves and stems are influenced by environmental factors and the genetic make-up (Murtiningrum *et al.*, 2012). Environmental factors such as altitude, soil type, and micro-climate significantly influence morphological expression (Thomson *et al.*, 2006). For instance, cultivars from highland areas may produce larger or more pigmented fruits due to lower temperatures and increased Ultraviolet (UV) exposure, which can enhance pigment biosynthesis.

Table 1: Physical characteristics of accessions from Papua (Indonesia (Murtiningrum *et al.*, 2012).

No:	Origin of accession (district)	Red-fruit accession	Core	Fruit flesh color	Fruit length (cm)	Drupa length (cm)
1	Manokwari/Masni	MID-M	Triangular	Red	62	1.3
2	Manokwari/Minyambow	MHY-M	Triangular	Dark red	76	1.8
3	Manokwari/Minyambow	MHB-M	Triangular	Red	71	1.8
4	Manokwari/Minyambow	MHG-M	Triangular	Red	42	1.7
5	Teluk Bintuni/Merdey	MMS-M	Triangular	Red	68	1.2
6	Teluk Bintuni/Merdey	MMY-M	Triangular	Red	70	1.3
7	Teluk Bintuni/Merdey	MMW-M	Triangular	Red	21	1.7
8	South Sorong/Aifat	MUSM-S	Triangular	Red	66	1.6
9	South Sorong/Aifat	MUSW-S	Triangular	Red	61	1.4
10	South Sorong/Aifat	MUA-S	Triangular	Red	59	1.6
11	Nabire/Nabire	MTB-S	Triangular	Red	52	1.5
12	Nabire/Nabire	MTM-N	Triangular	Red	53	1.8
13	Nabire/Nabire	MTK-N	Triangular	Dark red	54	1.6
14	Jayawijaya/Kelila	MTU-W	Triangular	Red	75	1.6
15	Jayawijaya/Kelila	MTM-W	Triangular	Red	60	1.6
16	Jayawijaya/Kelila	MTK-W	Triangular	Red	60	1.5

6.2 Nutritional Compositions

Extensive nutritional laboratory research conducted in Indonesia has revealed that marita oil contains a wide range of nutritional components. Murtiningrum *et al.* (2012) conducted physio-chemical analysis of 16 cultivars, and the results are presented in Table 2. The moisture content ranges from 40 to 52%, protein from 3.1 to 6.4%, carbohydrates from 61.4 to 79.6%, fat from 11.2 to 30.7%, calcium from 0.53 to 0.9%, iron from 8.32 to 39.37 ppm, and phosphorus from 0.01 to 0.33%. Sarungallo *et al.* (2016) also reported in a separate study on the same nutrition that marita contained 50.8 to 55.6% fat, 36.8 to 46.3% carbohydrate, 654 to 792 ppm phosphorus, and 4919 to 5176 ppm calcium. Bourke (2009) reported on the dietary contributions of marita in the Mt. Bosavi area in SHP, where marita accounted for 44% of fat intake, 15% of energy intake, and 11% of protein in local village diets. However, this study did not specify the particular varieties used for the nutritional assessments. NARI food scientist Miriam Simin did a preliminary analysis of two cultivars (*Pengine Yol* and *Kulang*) from Jiwaka Province at the Professor Kola Chemistry Laboratory, and the results are summarized in Table 2. Despite these efforts, comprehensive nutritional analyses of Marita cultivars across PNG remain incomplete, leaving a significant gap in understanding the full nutritional potential and variation among marita cultivars.

Table 2: Physio-chemical analysis results for *Pengine Yol* and *Kulang* from Jiwaka Province.

Red-fruit accession	Moisture (%)	Crude protein (%)	Iron (mg/Kg)	Calcium (mg/Kg)	Phosphorus (mg/Kg)	Zinc (mg/Kg)
Pengine Yol	77.2	7.2	109.3	2067	1433	21.6
Kulang	72.6	3.2	97.0	2115	1665	28.8

Table 3: Physio-chemical nutritional value of 16 accessions from Papua in Indonesia. Sourced: Murtiningrum *et al.*, 2012.

Red-fruit accession	Water (%)	Protein (%)	Carbohydrates (%)	Fat (%)	Calcium (%)	Iron (ppm)	Phosphorus (%)
MID-M	40.82±0.08	4.01±0.04	71.15±0.19	22.23±0.20	0.60±0.00	23.03±2.09	0.11±0.00
MHY-M	52.70±1.04	5.53±0.31	71.19±0.78	20.50±0.56	0.77±0.02	20.86±0.12	0.01±0.00
MHB-M	51.18±0.06	5.78±0.02	74.67±0.36	16.55±0.34	0.83±0.01	14.65±1.73	0.01±0.00
MHG-M	46.95±0.72	6.48±0.09	78.81±0.59	11.21±0.22	0.74±0.00	16.27±0.86	0.02±0.00
MMS-M	40.26±0.40	5.54±0.26	61.64±0.14	30.72±0.19	0.68±0.00	22.52±0.91	0.32±0.00
MMY-M	43.96±0.01	5.30±0.15	71.43±0.44	21.18±0.36	0.54±0.00	11.83±1.58	0.25±0.00
MMW-M	51.93±0.91	4.33±0.15	68.33±0.65	24.70±0.39	0.58±0.00	17.18±1.20	0.31±0.00
MUSM-S	51.53±0.29	4.77±0.35	77.77±0.17	15.00±0.13	0.90±0.05	39.37±0.36	0.29±0.00
MUSW-S	47.10±0.13	5.37±0.65	64.96±0.41	26.88±0.18	1.11±0.05	21.88±1.01	0.31±0.00
MUA-S	45.18±0.39	5.20±0.18	71.66±1.11	21.10±0.92	0.59±0.01	22.29±0.51	0.33±0.02
MTB-S	41.57±1.29	6.22±0.07	79.66±0.45	11.81±0.32	0.55±0.00	29.07±0.90	0.08±0.00
MTM-N	44.07±2.61	5.69±0.25	68.01±1.82	23.15±1.86	0.79±0.04	26.69±3.72	0.07±0.00
MTK-N	41.42±1.01	5.45±0.37	79.33±0.52	12.27±0.15	0.71±0.01	26.6±4.76	0.07±0.00
MTU-W	51.26±0.38	5.50±0.18	75.66±0.36	16.07±0.37	0.57±0.04	8.32±0.99	0.02±0.00
MTM-W	42.99±0.03	3.12±0.10	66.46±0.21	27.39±0.09	0.90±0.04	24.54±0.02	0.01±0.00
MTK-W	49.02±0.64	5.15±0.02	74.24±0.26	17.96±0.36	0.53±0.02	12.34±0.79	0.01±0.00

6.2. Chemical Compositions

Marita oil is rich in natural antioxidant chemicals or compounds such as α -carotenoids, β -carotenoids, β -cryptoxanthin, α -tocopherol, and unsaturated fatty acids omega 3 and 6 (Sarungallo *et al.*, 2015). Murtiningrum *et al.* (2012) analyzed 16 cultivars in Indonesia, and the results are presented in Table 4 below. Total carotenoids range from 388.75 to 3330.51 ppm, and total tocopherol ranges from 964.52 to 6778.49 ppm. Sarungallo *et al.* (2016) further stated that the main Fatty Acids of oleic ranges from 49.36 to 64.47g per 100g, linoleic from 4.13 to 16.06g per 100g, and palmitic from 14.11 to 19.21g per 100g. These antioxidant chemicals positively contributed to human health. The in-vivo studies reported its positive effects on health, including tumor inhibition and anti-cancer properties, anti-diabetic effects, anti-inflammatory activity, and immune system enhancement (Mun'im *et al.*, 2006; Suroño *et al.*, 2008). Astirin *et al.* (2009) specifically noted the potential of yellow marita fruit oil as an effective agent against breast cancer cells, suggesting it may outperform other conventional treatments. It is important to note that these studies were all from Indonesia. In comparison, the chemical composition of marita cultivars distributed throughout PNG remains unexplored and undocumented.

Table 4: Vitamins, total carotene and tocopherol composition of accessions from Papua in Indonesia. Sourced: Murtiningrum *et al.*, 2012.

No:	Red-fruit accession	Vitamin C (mg/100g)	Vitamin B1 (mg/100g)	Total carotenoids (ppm)	Total tocopherol (ppm)
1	MID-M	20.61±0.93	1.88±0.02	2584.82±224.78	11917.81±72.32
2	MHY-M	16.18±0.59	2.60±0.12	748.86±18.39	5927.11±512.26
3	MHB-M	8.02±0.16	2.30±0.04	332.58±92.36	2988.76±26.57
4	MHG-M	9.97±1.20	2.39±0.15	704.04±37.72	6778.49±293.79
5	MMS-M	12.53±0.11	0.97±0.03	1264.28±38.96	2294.12±211.48
6	MMY-M	18.90±0.00	1.09±0.01	1137.98±37.24	1180.54±46.37
7	MMW-M	21.88±1.27	2.47±0.00	593.89±27.94	2424.49±101.38
8	MUSM-S	9.42±0.61	2.11±0.00	547.96±51.29	2853.23±7.15
9	MUSW-S	8.45±0.28	3.13±0.02	857.90±15.62	1043.04±49.21
10	MUA-S	10.30±0.13	2.22±0.00	603.16±4.63	964.52±39.39
11	MTB-S	3.78±0.08	2.00±0.10	759.12±16.72	4529.84±1178.36
12	MTM-N	5.64±0.82	2.97±0.13	330.51±902.91	6736.36±1625.27
13	MTK-N	7.33±1.25	3.09±0.16	1185.80±198.52	6419.41±723.01
14	MTU-W	4.39±2.30	2.54±0.11	388.75±11.95	1848.96±150.63
15	MTM-W	7.40±1.07	2.21±0.11	545.80±63.46	2599.00±297.95
16	MTK-W	15.41±1.57	2.04±0.06	730.63±106.65	3665.85±521.64

6.3. Phylogenetic and molecular characterization

Prior to the discovery of plant molecular characterization, it is prudent to identify their morphological traits. The development of methods for species identification started with the morphological identification process, which was further consolidated by molecular identification techniques based on short DNA sequences (Zebua *et al.*, 2019). For example, molecular characterization of DNA by Zebua *et al.* (2019), showed that six of the 39 cultivars are 90% similar, although they have various morphological features. Dissimilarities among the sequences indicate genetic divergence as a result of molecular evolution during the course of time. This often involves techniques like DNA sequencing, amplification, or using molecular markers to identify and understand genetic characteristics.

Zebua *et al.* (2019) recommended a standard DNA barcode for plant identification is the maturase gene K (matK). The matK is often used in the study of plant phylogenetic or plant molecular identification. Rachma *et al.* (2017) highlighted the advantages of plant molecular identification using barcoding DNA technique as follows: (1) the molecular identification can be done by anyone; (2) the DNA sequences is not influenced by the environment; (3) molecular identification is easy and fast if DNA sequence target species is provided.

7. FUTURE RESEARCH DIRECTIONS

The majority of the research on marita, including agronomic practices, pest and disease management, varietal characterization, and molecular studies has been conducted in Indonesia. In contrast, PNG's cultivars remain significantly understudied, particularly in terms of morphological, physio-chemical, molecular characterization and agronomic practices. According to email correspondence with Bourke, most of his work focused on providing general background information about marita and emphasized the need for further, in-depth research on this indigenous crop. Similarly, Kambuou (1996), in the FAO publication on PNG's plant genetic resources, also underscored the need for more detailed investigations to support the conservation and utilization of marita in PNG.

A key research priority moving forward is the identification and classification of cultivar diversity across different agro-ecological zones in PNG. This should be accomplished through comprehensive morphological, physio-chemical, and molecular analyses. Once high-value cultivars are identified, further research should focus on optimizing production systems, developing value-added products, and exploring the potential for commercialization and export, particularly of marita oil, which holds significant promise in both domestic and international markets.

8. CONCLUSION

This literature review aimed to evaluate existing research on marita and to identify key knowledge gaps to guide future research priorities. The review revealed that most Marita-related studies had been conducted in Indonesia, primarily focusing on domestic cultivars. These studies cover a range of areas, including cultivar diversity, agronomic practices, pest and disease management, and laboratory-based nutritional, chemical, and molecular analyses. In contrast, PNG has yet to undertake comprehensive, formal research on its own marita cultivars. The limited information available, such as that provided by Bourke (2009), offers only a general background on the crop. No in-depth characterization or molecular studies specific to PNG cultivars have been published. Given marita's cultural, nutritional, and economic significance, further PNG research is necessary and worthwhile.

Priority areas include morphological, physio-chemical, and molecular characterization for cultivar identification, agronomic practices, pest and disease management, harvesting, and processing techniques. Future research should focus on identifying and cataloguing the diverse marita cultivars across PNG. From this, high-value cultivars can be selected for targeted research, value addition, and potential product development and commercialization.

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