



## Research on the Pineapple Crop

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Developing sustainable products from renewable materials represents a large dispute in the last few years. Malaysia, as a tropical country, is one of Asia's largest producers of pineapple plants. As the expansion of pineapple plantations commenced, mass production of agricultural waste also occurred consisting of residual pulp, peels, stems and leaves due to the screening process of components unsuitable for human consumption. Pineapple leaves are among the agriculture residues generated from large pineapple cultivation and to date, the agriculture waste management process in Malaysia is still underdeveloped. In the vast agricultural sector, a cheap, sustainable, and biodegradable alternative method to manage waste is required.

In Malaysia, the development of pineapple plantations is governed by the Malaysian Pineapple Industry Board (MPIB). In 2019, Malaysia's pineapple export produced a total amount worth RM 493 million in a year compared to RM 343 million in 2018. Recently, a new allocation under the 12th Malaysia Plan (12MP) worth RM 137 million was pledged to Lembaga Perindustrian Nanas Malaysia (LPNM) by the Ministry of Agriculture and Food Industry (MAFI) to enhance the industrial growth of the pineapple sector for all supplier chain including smallholder farmers by increasing the average income of pineapple owners between RM 5,000 to RM 8,000 per month. Currently, there are nine cultivars grown in Malaysia namely Morris, N36, Sarawak, Morris Gajah, Yankee, Josephine, Masapine and most recently MD2.

MD2 variety bred from the parent hybrids containing the composition of 'Smooth Cayenne' 17, 'Smooth Guatemala' 6, 'Pernambuco' 4, 'Ruby' 4, and 'Queen' 1 at the Pineapple Research Institute of Hawaii. In Malaysia, the MD2 variety was introduced by the Malaysian Pineapple Industry Board in 2008 through the purchasing of pineapple sucker from the Philippines. Originating from the Philippines, the pineapple was then introduced into Malaysia, and

it was discovered that the land in Malaysia is very suitable for the planting of MD2 pineapple, hence producing higher quality and sweeter pineapples. By 2015, MD2 was largely grown in Johor and slowly moved to other states. Currently, MD2's variety accounts for the biggest plantation in Malaysia instead of other varieties and is likely continuing to grow due to high demand in the local and world market.

Accordingly, the pineapple residual leaves act as a good natural fibre source. The advantage of natural fibres is their continuous supply, renewable resources, easy and safe handling, biodegradability, flexural high modulus and low cost of production. Due to its outstanding fibre properties, pineapple leaf fibre is suitable for wide applications such as building and construction materials, composite enforcement, automotive components and the furniture industry. Besides, this new source of material has also been used in the textile industry like table linens, bags, clothing items and mats. Nowadays, pineapple leaf fibre is utilised to develop various utility articles as well as high-end fashion garments. Another innovation from pineapple leaf fibre is in the production of high-quality textiles including in the production of clothing as a substitution for the gold thread on songket motifs on clothing. These innovations can be seen as a new source of income for pineapple entrepreneurs in Malaysia. Thus, various innovations from pineapple waste can be proposed to add value to the pineapple waste which will also conserve the environment and act as a source of income for pineapple entrepreneurs in Malaysia.

Various processing techniques are accessible for the extraction of pineapple leaf fibre following their desired application. Pineapple leaf fibre can be mechanically extracted by using a decorticator machine. By using this technique, the major element involves in the machine operation are the feed roller, leaf scratching roller and

serrated roller. Implementing manual extraction, manual combing, scrapping the leaves and combing, the decorticator machine has almost similar specific functional operation to manual extraction. In some scenarios, sharp-edge tools were used to scrap out the fibre. In addition, the process of extraction of fibres from the plants through separation, dissolution, and decomposition of pectins, gums and other muscle elements is called retting.

Recently, researchers have shown increased interest in the dyeing behaviour of pineapple leaf fibre. The colouration of pineapple leaf fibre can increase its aesthetic and potential value as the end product. Pineapple leaf fibre can be dyed with both natural and chemical dyeing. The dyeing process can be applied in different stages including the fibre strand, thread, and fabric. Originally yellowish in colour, pineapple leaf fibre can produce brilliant, deep, and light colour hues prior to the application of dyes. Dyeing pineapple leaf fibre could enhance the fibre properties to place it through a large market which then might be able to fulfil the increasing natural fibre demand.

People have become more enthusiastic about natural products and natural fibres have been gaining an expressive role as an alternative to synthetic-based fibres. In that sense, the growth of natural fibre from pineapple leaf configures a scenario of a growing discrepancy between fibre supply and demand, which refers to the “fibre gap”.

### Conclusion

In conclusion, various applications from pineapple plants bring a better approach to fulfilling the demand of manufacturers, research purposes and development departments in Malaysia along with the import-export activities.