Notes on importance and prospects of rambutan (*Nephelium lappaceum* L.): A lesser-known fruit crop in Ghana

L. ABBEY
Crops Research Institute, Council for Scientific and Industrial Research, P. O. Box 3785, Kumasi, Ghana

ABSTRACT

Rambutan is an important but lesser-known fruit crop in Ghana. It is a major foreign exchange earner for some countries in South-east Asia. The leaves, fruit, rind, kernel, trunk, and roots are important in food and nutrition, medicine, industry or combination of these. Imbalances in sex ratio, recalcitrance of seeds, long gestation period, high death rates and loss of vigour of transplants, and pests and diseases are some major limiting factors to rambutan production. Stem cuttings are also difficult-to-root. Currently, layering is the recommended method of vegetative propagation. Recent studies on rapid and easy multiplication techniques using biotechnology are yielding results that could be adopted in future. The humid, tropical rainforest climate in some regions in Ghana would be suitable for rambutan production. The available rambutan germplasm in the two research stations at Bunso and Kade should, therefore, facilitate its initial introduction into the local farming systems. Commercial production and processing of rambutan into various products would further diversify the non-traditional export base of horticultural crops. It would also have the advantage of protecting the environment, especially in peri-urban and urban areas.

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RÉSUMÉ

ABBEY, L.: *Notes sur l'importance et les perspectives de ramboutan (*Nephelium lappaceum *L.): Une culture fruitière moins - connue au Ghana.* Le ramboutan est une culture fruitière importante mais moins-connue au Ghana. Il est un gagnant majeur des devises étrangères pour quelques pays au sud-est d' Asie. Les feuilles, le fruit, l'écorce, l'amande, le tronc et les racines sont importants pour l'alimentation et la nutrition, la médecine, l'industrie ou une combinaison de ces domaines. Les déséquilibres dans la proportion des sexes le caractère récalcitrant des graines, la longue période de gestation, les taux de mortalité élevés, la perte de vigueur des transplants, les insectes ravageurs et les maladies sont quelques facteurs contraignantes majeures à la culture de ramboutan. Les boutures des tiges sont également difficiles à enraciner. Actuellement, le marcottage est la méthode recommandée de la propagation végétative. Les études récentes sur les méthodes de multiplication rapides et faciles employant la biotechnologie rendent des résultats qui pourraient être adopté dans l' avenir. Le climat de la forêt tropicale humide dans quelques régions pourrait être convenable pour la culture de ramboutan. Le germeplasme disponible de ramboutan aux deux stations de recherche à Bunso et Kade doit par conséquent, faciliter l' introduction initiale aux systèmes locaux de culture. La production et le traitement commerciaux de ramboutan en divers produits pourrait encore diversifier la base d'exportation non-traditionnelle des cultures horticoles. Il aurait également l'avantage de protéger l'environnement surtout dans les zones urbaines et périurbaines.

Introduction

Rambutan, also called hairy lychee, is an evergreen, bushy, dioecious tree. It belongs to the family Sapindaceae and originated from Malaysia in South-east Asia (Purseglove, 1988). The plants are grown in mixed cropping systems. It is also grown as a sole crop on a commercial scale in countries such as Thailand, Singapore,

Indonesia, Philippines, and Malaysia. More importantly is rambutan's significant contribution to foreign exchange earnings of these countries (Concepcion Wagdali, personal communication). There is a trend of increasing volume of exportation to Europe and some parts of Asia. For instance, between 1981 and 1984, exportation of canned rambutan from Thailand rose from US $620 to US $1,740 (Tindall, 1992). Rambutan is also gaining agronomic and commercial importance in tropical Australia, central and southern parts of Africa, and South America (Tindall, 1992; Nakasone & Paull, 1998).

In most tropical African countries, including Ghana, it is a lesser-known crop but few trees can be found. For example, in Ghana, research stations such as the University of Ghana Agricultural Research Station, Kade and the Plant Genetic Resources Centre, Bunso, have few rambutan trees for propagation studies. Typically, rambutan is a tropical rainforest crop with an average water-use of between 32 and 68 mm week^{-1}, depending on cultivar and stage of growth. It grows to a height of between 18 and 20 m (Nakasone & Paull, 1998), has an average fruit weight of between 17 and 41 g, and yield per tree of between 16 and over 400 kg (Tindall, 1992), depending on cultivar and growing conditions. At harvest, 100 g of fruits contain high contents of water (80-82 %), sucrose (10 g), energy (297 KJ), potassium (14 mg), and vitamin C (70 mg) levels (Tindall, 1992; Nakasone & Paull, 1998). The production of rambutan is, however, limited by propagation failures, pests and diseases, and post-harvest losses. It is, therefore, necessary to step up research to combat these constraints.

There is a general trend of increasing demand for rambutan fruits in the market place (Tindall, 1992). Thus, rambutan has future prospects in the export market. Ghana lies in the tropical rainforest belt and has fertile lands for rambutan production. The few trees in the country are performing well and as a result, selection of the most suitable cultivar(s) and improving the method of propagation will promote its production in Ghana (Gamel, PGRC, personal communication). This will add diversity in the non-traditional export trade currently being promoted in the country.

This paper seeks to highlight on the importance of rambutan and attempts to promote its production and use in Ghana.

Propagation methods and problems

Seeds of rambutan are sown directly after extraction and washing due to their recalcitrant nature. Trees propagated from seeds have longer gestation period than those vegetatively propagated. For instance, germination and fruit bearing take 7 to 20 days and after 5 to 6 years, respectively, while budded trees come into bearing after 1to 4 years (Anonymous, 1991). Workers have shown that the percentage germination of freshly prepared seeds varies between 70 and 95 per cent (Anonymous, 1991; Tindall, 1992). Commercial production of rambutan in South-east Asia comes by and large from clonal trees. Propagation methods include budding, grafting, and layering (marcotting).

The success of vegetative propagation techniques primarily depends on species, experience, environmental conditions, and available resources (Garner *et al.*, 1976; Walter, 1976; Hartmann, Kester & Davies, 1990). It has been reported that layering improves flowering and fruiting in plants that have problems with proportion of male to female-flower formation and fruiting (Garner *et al.*, 1976; Janick, 1986; Anonymous, 1991). The application of the layering technique resulted in 80 per cent rooting in immature branches of the cultivar, 'Seechompoo', without using growth hormone (Tindall, 1992). These suggest that by developing the technique of layering, the limitation imposed by the unpredictable female-to-male ratio, as well as the long gestation period of sexual propagation could be minimized.

Processing and use

About 1 to 2 per cent rambutan flowers form fruit

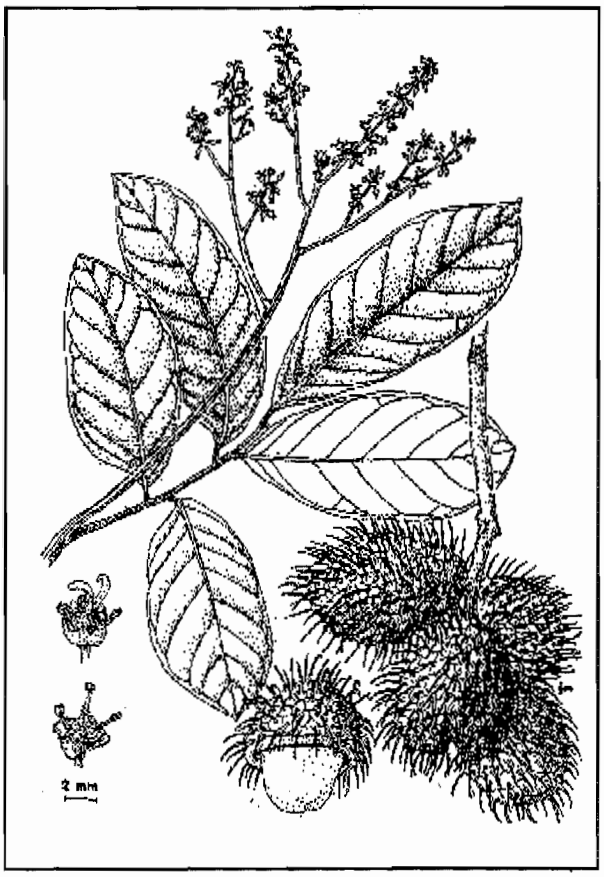

Fig.1. Leaves, flower and fruit showing the aril of rambutan (adapted from Nakasone & Paull, 1998).

in clusters of 10 to 18. The fruits are large, ovoid or globose with long spines and an average length and width of 4.5 and 3.1 cm, respectively (Fig. 1). The main edible part of the fruit is the white and juicy aril that encloses a nut-like kernel. The various tissues of rambutan are processed in different forms for different purposes, including the following:

1. Fruits are soaked in 40°Brix sugar syrup and dried to a moisture content of 19 per cent and stored.
2. Fruits with high Brix reading (i.e., 14-20°) are canned in syrup after peeling.
3. Fruits are eaten fresh and also used in preparing salads.
4. Kernel is cooked and eaten, and have narcotic properties.
5. Fruits are used for making jams, jellies, and rambutan tallow (solid fat) that is edible and also used for making soaps and candles.
6. The tree trunk, as wood, is hard and is used for construction.
7. Leaves and skin of fruit are used as dye.
8. The fruit has anthelmintic properties and the roots are used for treating fever.
9. Diseases of the tongue can be treated with the bark.

Future prospects

The potential of rambutan as a tropical fruit tree crop needs to be fully explored in Ghana. Although rambutan is ranked among the minor fruit crops world-wide, its increasing popularity and acceptance would make it an important commercial crop in the near future (Anonymous, 1991). The leading producers and exporters are from East Asia, namely, Indonesia, Malaysia, Thailand, and Philippines. These countries might be unable to supply enough to meet world demand. Thus, there is potential for rambutan to become a non-traditional export crop for Ghana if attention is paid to its propagation, growth, handling, storage, and marketing. The promotion of rambutan cultivation in Ghana would further boost agricultural diversification to increase non-traditional export earning, since the crop is becoming popular on the world market. Locally, it will increase farmers' income and indirectly facilitate forestation and environmental protection programmes in peri-urban and urban areas. It will also add to the variety of fruits consumed locally.

Research needs

Walter (1976), Tindall (1992), and Nakasone & Paull (1998) have comprehensively reported findings of recent works on rambutan. Elsewhere,

workers are focusing on propagation techniques to balance sex ratio in rambutan population. Usually, gibberellic acid promotes maleness, while auxin, cytokinin, and ethylene promote female flower development (Luckwill, 1981). Thus, the effect of the application of these chemicals on rambutan must be investigated. Applications of paclobutrazol and ethephon have been reported to increase bud formation and flowering. Also, spraying the panicles with sodium naphthalene acetate (SNA) or naphthalene acetic acid (NAA) enhances fruit set. Early training and regular pruning improve plant architecture, control pests and diseases, and induce vigorous canopy regrowth.

Work in Ghana should start from germplasm assemblage, selection for not only fruit quality characteristics, but also for yield and tree size. These attributes may be linked to the number of fruits per panicle and the number and fruitfulness of laterals emerging on twigs that have borne the previous crop. Attention must be given to selection or development of disease-resistant and/or tolerant cultivars, and short-crop cycle varieties. Post-harvest and market research is also needed.

Conclusion

Rambutan is a lesser-known fruit crop in Ghana. It is fairly rich in nutrient and has the potential of becoming a non-traditional export commodity. Rambutan has medicinal value and many parts of the tree can be used in industry. It is, however, constrained by several factors such as imbalance sex ratio, long gestation period, root-shy, and pests and diseases. There is a dire need for more intensive research on cloning operation technique(s). This will enable easy and rapid multiplication of propagules. Research in genetic engineering and tissue culture is essential to eliminate undesirable traits. Rambutan could also be trained to become dwarf, small, and accessible to facilitate its incorporation into agroforestry systems. The Plant Genetic Resources Centre, Bunso, and the University of Ghana Agricultural Research Station, Okumaning-Kade, have collections of rambutan germplasm and, therefore, initial work to select and overcome rooting problems would be laudable.

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