

Product development of sola plant (*Aeschynomene aspera* Linn.) for economic benefit of the community

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Abstract

Sola plant (*Aeschynomene aspera* Linn.) is an aquatic broad-leaved weed in deep water rice paddy fields. It is native to South and Southeast Asia. Its cortex pith is an excellent raw material for several types of handicrafts. The handicraft product from sola plant in Thailand is paper-pith flower e.g. jasmine, sunflower, chrysanthemum, gerbera, red ginger, poppy and lotus. This research is aimed at establishing models with various diversity of products from stem pith and stem bark of sola plant to promote economic benefit to the community enterprise via women's OTOP (one tumbon one product) group in the central provinces: Ayutthaya, Angthong, Suphanburi, Nonthaburi and Pathumthani. The peeling machine was developed to help reduce time of peeling. It took a day to finish 1000 g of sola stem peeling process. The scores of customer satisfaction on the new models ranged from 4.05 to 4.88 regarding a scale of one to five with a score of one representing 'very dissatisfied' and five representing 'very satisfied'.

Keywords : Sola plant (*Aeschynomene aspera*), product developmen

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Sola plant is commonly called sano-hangkai in Thailand as their new shoot looks like hen's tail. There are several species of sano plants in Thailand, most of them are leguminous common weeds in rice paddy fields. They are, for example, sano-hangkaiyai (*Aeschynomene aspera* Linn.), sano-hangkailek (*Aeschynomene indica* Linn.), sano-kindok (*Sesbania javanica* Miq.), sano-kangkoak (*Sesbania niabisi* Faw. & Rendle), and sano-african (*Sesbania rostrata* Bern. & Oldrm.). The promising species are sano-kindok and sano-hangkai (Figure 1 and 2).

Sano-kindok (*Sesbania javanica* Miq.) or commonly known as sano, a semi-aquatic plant of marsh and temporarily wet land, is native to tropical Asia. The name "kindok" is derived from their edible flowers. The fresh unopened racemose inflorescence with 5-7 florets is picked up early in the morning so as to endure transportation. It was found that the sano flower bloom in the afternoon not in the morning as it was said. The petals start to open in the afternoon from 1-2 pm until dark, they close at night. Thai people consume both unopened and full bloom but the unopened is preferable. A number of traditional recipes from the yellow sano flowers are popular among Thai people in the central : sano omlette, stir fried, spicy sour soup, spicy salad and sano dessert.

There is a potential possibility for product development, including herbal tea from sano flower, bolete ectomycorrhizal fungi inoculation in the root zone of sano plant and microgreen production from sano seed (Muchjajib and Sirikesorn, 2010). Sano flower is the symbolic flower of Ayutthaya Province, the old capital city of Thailand.

Sano-hangkaiyai (*Aeschynomene aspera* Linn.) or sola plant is an aquatic broad-leaved weed in lowland rice paddy fields which is native to Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand and Vietnam. Its cortex pith is an excellent raw material for several types of handicrafts, sunhats and artificial flowers (Mehraet *et al.*, 1975; Datta and Banerjee, 1978; Nesbitt *et al.*, 2010). The potential product in Thailand is paper-pith flower e.g. jasmine, chrysanthemum, gerbera, red ginger, poppy and lotus (Muchjajib and Nittayapongchai, 2009). This study is aimed at establishing models with various diversity of products from the stem pith and the bark of sola plant to promote economic benefit to the community enterprise via women's OTOP (one tumbon one product) group in the central Provinces: Ayutthaya, Angthong, Suphanburi, Nonthaburi and Pathumthani.

FINDINGS

The studies on morphological characteristics, the peeling machine development and the product development for sola plant were carried out in the central region of Thailand; Ayutthaya and Prachinburi Province. Satisfaction data were collected through a questionnaire developed with aspects of new design and usage. Customer satisfaction data were collected from 200 retail customers at the one tumbon one product (OTOP) exhibition in Bangkok and Ayutthaya. Measuring customer satisfaction by grading on a scale of one to five with a score of one representing "very dissatisfied" and five representing "very satisfied". All surveys were then averaged for a composite score.

The planting system for sola plant in Thailand is a mixed-intercropping with rice cultivation by direct seeding method. Therefore the high germinating percentage seed is preferable. The sola seeds with different seed

coat colors gave different germination percentage; the gray yellow seed gave the highest germination percentage with 68.50% while the black seed gave only 14.00%. Breaking dormancy of sola seed was done by soaking in different temperatures for 12 hours. The optimal temperature was 70-100 °C giving 69.75-78.50 germination percentage (Sirikesorn, 2008).

The production of sola plant in paddy field was carried out in Prachinburi. Seed sowing was done in the rice paddy field starting in April. Nodules were formed on the stem of sola plants. It could exhibit a nitrogen fixing potential as found in *A. afraspera* (Alazard, 1985). It took 5 months to fully grown stem; 1.5-2.0 m tall, 3-5 cm of diameter with white soft cortex. Sola stems were harvested in September. After drying for 1 week, they were delivered to Ayutthaya as raw materials for handicrafts with the price of 2 baht per a sola stem.



Sano plant



Sano flower (unopened)

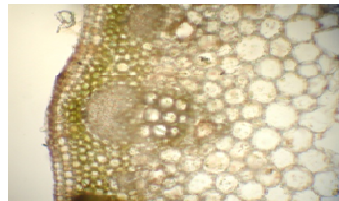


Sano flower (blooming)

Figure 1 Sano plant (*Sesbania javanica* Miq.).



Sola plant

Sola stems ready
to be transported

Sola cortex pith

Figure 2 Sola plant (*Aeschynomene aspera* Linn.).

The peeling machine was developed to help reduce time of peeling (Figure 3). The comparative results are shown in Table 1. It took a day to finish 1000 g of sola stem peeling process while it took 3-7 days by hand

peeling but the quality of sola sheet was not as smooth as hand peeling. An improvement needed to be done to achieve a long and smooth sola sheet from the peeling machine.



Hand peeling



Peeling machine

Figure 3 Hand peeling and machine peeling for sola plant.







Table 1 A comparison method between hand-sola sheet and machine-sola sheet .

Peeling method	Pith pad (g)	Duration of peeling (day)	Cost of peeling (baht)	Returns (baht)
Hand peeling	800-900	3-7	800-1000	3000-4000
Machine peeling	400-600	1-2	700-800	2000-3000

There were several models for product development of sola plant to be used in special occasions i.e. Arranged Jasmine for Mother's Day, Valentine Rose, Blessing Baisee for decoration, Floating Sano for Loykrathong Festival, Altar Offering Panpoom for royal ceremonies and mobile sano for decoration. The customer satisfaction score of the new products is shown in Table 2.

Satisfaction data were collected through a questionnaire developed with aspects of new design and usage. The satisfaction score of customers for 6 models were as follows: 4.88, 4.47, 4.45, 4.38, 4.25 and 4.05 on a 1 to 5 scale. The income of sola handicraft women group of Klong Suanplu District in Ayutthaya is 9,000 baht per month.

Table 2 Customer satisfaction score of the new products from solar pith and sola bark.

Production items		Satisfaction score	Product price (baht)
Jasmineon Mother's Day		4.88	240
Valentine Rose		4.47	180
Blessing Baisee		4.45	140
Floating Krathong		4.38	170
Altar Offering Panpoom		4.25	570
Hanging Sano		4.05	740

Conclusions

Sola (*Aeschynomene aspera* Linn.) is a promising local plant for handicraft production in central Thailand. The sola sowing system is a mixed-intercropping with rice cultivation. It takes 5 months from seed sowing to stem harvesting. The machine is developed to help reduce time of peeling. It takes a day to finish 1000 g of sola stem peeling. The satisfaction scores of customers for the developed products range from 4.05-4.88 on a 1 to 5 scale. The members of sola handicraft women group, Klong Suanplu Ayutthaya earn 9,000 baht per month.

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