

THESIS TITLE : EVALUATION OF MANUALLY OPERATED MACADAMIA NUT CRACKERS

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ABSTRACT

The objective of this study was to test and evaluate manually operated macadamia nut crackers with the emphasis on comparison of their capacity and quality of the kernels after cracking. The specific objectives were to study physical properties related to the cracking of macadamia nuts, compare manually operated macadamia nut crackers available in Thailand, modify a compressed screw macadamia nut cracker, and to evaluate economic performances of the promising crackers. The nuts used for the study were mixed variety produced in Thailand.

Five designs of the cracker, vise grip cracker, imported cracker from New Zealand, compressed knife cracker, rack gear cracker, and compressed screw cracker were tested and evaluated. Cracking capacity,

percentage of whole kernel recovery, percentage of half kernel recovery, and percentage of fraction kernel recovery were used as indicators of their performances. The results of the study can be summarized as follows:-

1. In order to facilitate the high cracking capacity and obtain a high recovery of whole kernels, the nut kernels should be loosen from shells before cracking.

2. The cracking of macadamia nuts should be done on the extreme end of the seed by placing the blade on the seam of the seed. When pressed, the nut shell separated along the seams. This enabled a high recovery of whole kernels. Raw macadamia nuts normally have seeds with 30 % of seam ready to be separated. This increased by 11 % after the kernels had been dried. Cracking nut kernels with seams required less force. The results of cracking when compared to that of nut kernels without seams were found to obtain a higher capacity, higher recovery of whole kernels, and less half kernels, while fraction kernels did not differ statistically.

3. The use of a sharp blade (40 degree angle) resulted in higher capacity and quality of kernel after cracking compared with the blade having 74 degree angle. This is due to the fact that sharp blade requires less force to crack but requires a repeated operations in order to separate the shell, whereas in using a less sharp blade the shells could be separated in one cracking operation, but requires more force to crack. It was found that after the shell was cracked the blade moved downward, thus damaging the kernels resulting in a high percentage of fraction kernels.

4. The compressed screw cracker with sharp blade and the vise grip crackers were found to be the most promising crackers. Their

Technical performances for the mixed size smooth shell macadamia nut popularly grown are as follows:-

	Compressed Screw Cracker	Vise Grip Cracker
- Cracking capacity (seed/hour)	130.16	151.09
- Whole kernels (%)	41.00	44.00
- Half kernels (%)	51.50	46.20
- Fraction kernels (%)	7.50	9.80

5. With the estimated price of unshelled macadamia nut of 50 Baht/kg, the price of whole kernel of 400 Baht/kg, and neglecting the cost of nut preparation before shelling and other minor costs, the use of either compressed screw cracker or vise grip cracker will be break-even when process only 7.7 kg of nuts per year. Payback period is less than 3.5 months when process 100 kg/year. A profit of over 23,000 Baht per year can be made when operate 200 days a year for 8 hours per day.