# 2-IN-1 CRACKSEP FOR DIRT-FREE KERNELS IN OIL PALM BUNCH ANALYSIS

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In oil palm bunch analysis, one of the bunch quality components measured is kernel content (*Figure 1*). This has been determined by manually cracking oil palm nuts using a hammer. Such a method results in broken kernels, which makes separation of the kernels from the broken shells cumbersome and time-consuming.

In order to overcome the slow and tedious process of cracking oil palm nuts and collecting the kernels from the cracked mixture, a machine was designed, namely, a two-in-one nutcracker and separator, or 2-in-1 CrackSep in short. This machine provides a semi-automatic processing method to speed up cracking of the nuts and collection of the kernels.

## NOVELTY OF THE TECHNOLOGY

As the name implies, the machine has two basic components:

- a cracker; and
- a separator.

The cracker was designed based on the concept of 'press between gears'. Two non-parallel adjustable gears are fixed in the cracker. Cracking of nuts takes place in the space between the gears, which is adjustable to suit the size of nuts and to reduce the inadvertent cracking of the kernels. This feature also prevents nut escapes, thus, ensuring that all nuts are cracked in the machine.

After cracking, the mixture of broken shells and kernels falls into the separator. The separator is a cylindrical chamber with multiple apertures. When the separator rotates, due to the differences in weight and size of the broken shells and kernels, the broken shells will pass through the apertures while the kernels will roll to the end of the separator and fall into a collection tray.


*Figure 1. Flow chart for the manual extraction of kernels in oil palm bunch analysis laboratory.*

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## THE PROTOTYPE

A prototype, called the 2-in-1 CrackSep machine (*Figure 2*), was developed and tested. The time taken to process *dura* and *tenera* nuts was recorded for both the conventional method (using a hammer) and when using the 2-in-1 CrackSep prototype (*Table 1*). The prototype took an average of 3.00 min to crack and separate 30 *dura* nuts, and 2.55 min for 30 *tenera* nuts. The conventional method took 7.31 and 6.98 min to crack and separate 30 *dura* and *tenera* nuts, respectively.

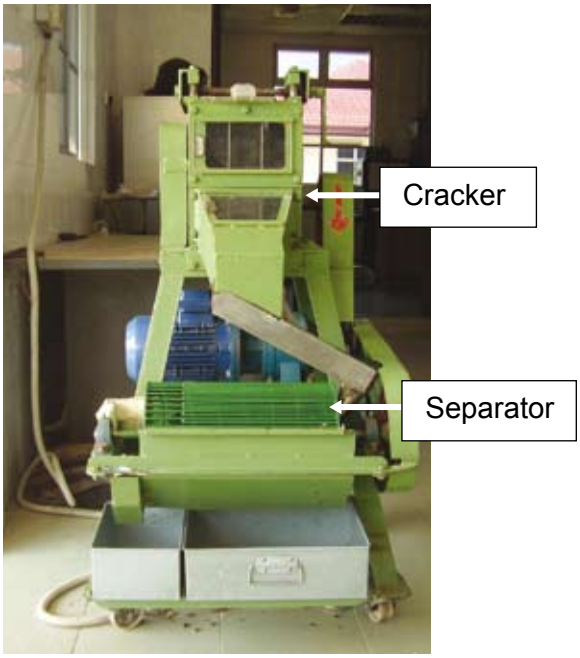


*Figure 2. The 2-in-1 CrackSep.*

**TABLE 1. COMPARISON OF TIME TAKEN TO CRACK AND SEPARATE OIL PALM KERNELS USING A HAMMER AND THE 2-IN-1 CRACKSEP**

| | | Fruit form | |
|---|---|---|---|
| | | ***Dura*** **(min)** | ***Tenera*** **(min)** |
| Hammer | Experiment 1 | 7.20 | 6.90 |
| | Experiment 2 | 7.33 | 7.00 |
| | Experiment 3 | 7.45 | 7.03 |
| | Average* | 7.31 | 6.98 |
| 2-in-1 CrackSep | Experiment 1 | 3.05 | 2.70 |
| | Experiment 2 | 3.01 | 2.50 |
| | Experiment 3 | 2.95 | 2.45 |
| | Average* | 3.00 | 2.55 |

Notes: Number of nuts per experiment: 30.
* Significant at $p = 0.05$, between hammer and 2-in-1 CrackSep.

## BENEFITS

- The 2-in-1 CrackSep is twice as efficient as the hammer or manual method of cracking and separating oil palm nuts.
- The 2-in-1 CrackSep produces cleaner and more intact kernels than the conventional method of hammering the nuts and extracting the kernels (*Figures 3* and *4*). This reduces error due to loss of broken kernels when determining kernel content in bunch analysis.

*Figure 3. Kernel extracted by the conventional method.*

*Figure 4. Kernel extracted using the 2-in-1 CrackSep.*

## CONCLUSION

The 2-in-1 CrackSep reduces the time taken for extracting kernels during oil palm bunch analyses. The machine produces cleaner, intact kernels and, as such, loss of broken kernels are minimized. This increases the accuracy in determining kernel-to-fruit and kernel-to-bunch ratios in bunch analysis.

For more information kindly contact:

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