

SureSawit™ SHELL – A DIAGNOSTIC ASSAY TO PREDICT OIL PALM FRUIT FORMS

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The oil palm has three naturally occurring fruit forms, varying in shell thickness: i) thick shell *dura*, ii) thin shell *tenera*, and iii) shell-less *pisifera* (Figure 1). *Teneras* are hybrids between the *dura* and *pisifera*, and the preferred commercial planting material. Oil yield of *tenera* is up to 30% higher than the *dura*, while *pisifera* is female sterile and does not usually produce matured bunches.

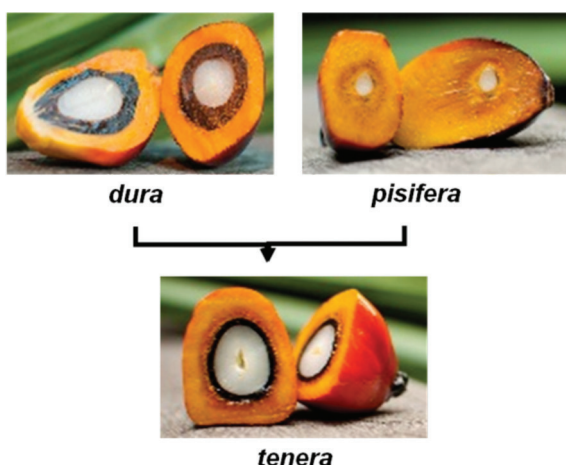


Figure 1. The oil palm fruit forms.

THE PROBLEM

At present, it is only possible to determine the exact fruit form of the palm two to three years after field planting, when the bunches appear. *Dura* contamination may occur in commercial plantings, and by the time it is discovered, it could be too late to remove the palms. As such, lower oil yield has to be tolerated for up to 25 years, before replanting.

In oil palm breeding, maternal lines (*dura*) and paternal lines (*pisifera*) are developed and evaluated separately to produce the best parental lines for producing the commercial hybrid *tenera*. To produce *pisifera* parental lines, *teneras* are either selfed, crossed to another *tenera* (*tenera* x *tenera*) or crossed to a *pisifera* (*tenera* x *pisifera*). In the *tenera* selfed or *tenera* x *tenera* crosses, apart from *pisifera*,

the progenies are also segregating into *dura* and *tenera*. In a *tenera* x *pisifera* cross, *tenera* is produced apart from *pisifera*. In all crosses above, breeders are not able to distinguish the three fruit forms until the bunches are produced, and as such, all palms are planted in order to identify the *pisifera* two to three years later.

THE SOLUTION

MPOB has developed a molecular diagnostic assay that can distinguish all three fruit forms in the nursery. Analysis of the leaf samples can determine the exact fruit form with precise accuracy (Figure 2).

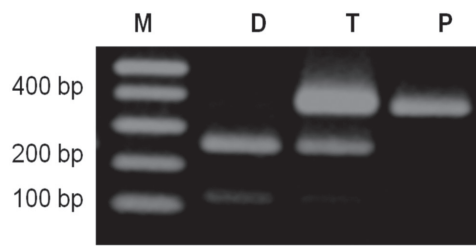


Figure 2. Differentiating *dura* (D), *tenera* (T) and *pisifera* (P) fruit forms. M is the 100 bp DNA ladder.

COMMERCIAL ASSAY KIT DEVELOPED

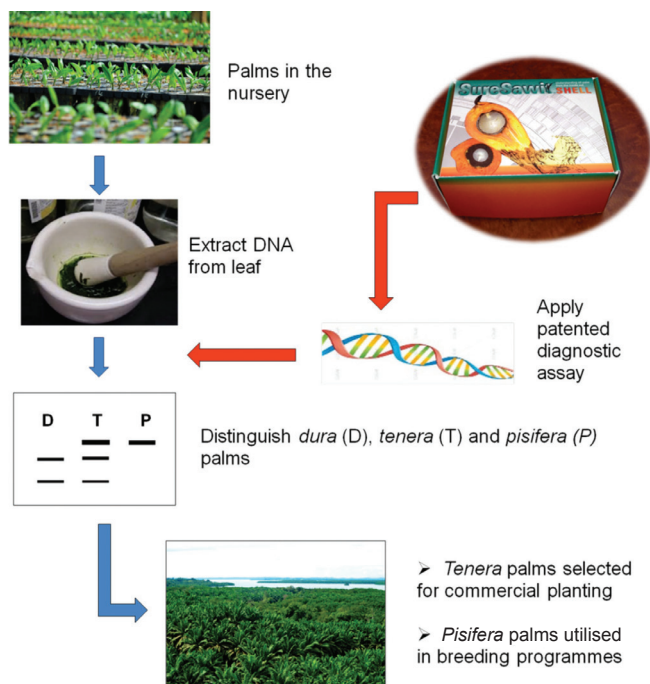
A commercial assay kit known as *SureSawit™ SHELL* was successfully developed as an easy, fast and accurate way of differentiating the three different fruit forms (Figure 3). The assay requires basic laboratory equipment to execute.



Figure 3. *SureSawit™ SHELL* kit



THE PROCESS



IMPACT

The first successful application of molecular diagnostic assay for oil palm. The molecular diagnostic assay provides an opportunity to improve productivity within existing acreage.

PUBLICATION

The molecular probe received international recognition when the science behind the discovery was published in two back-to-back publications in the highly renowned international journal, *Nature*. The two publications are *Nature* (2013) 500: 335-339 and *Nature* (2013) 500: 340-344

PATENT

MPOB owns the intellectual property (IP) rights to the discovery through patents filed in Malaysia (PI 2013700413) and the United States (61,847,853,USA).

WHO WILL BENEFIT?

- Oil palm plantation companies and smallholders who can now ensure that only commercially viable *tenera* fruit forms are planted.
- Breeders who can now improve efficiency of their breeding programmes, to speed up the production of new and improved planting materials.
- Enforcement agencies who can now ensure that seed producers, tissue culture laboratories and nurseries only supply the *tenera* planting materials.

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