

EXERCISE > DNA FINGERPRINTING AND PLANT POACHING

You have been out of town for a week's vacation, and when you roll into your driveway, you are shocked because the huge black walnut tree next to your garage is missing! You walk around the garage, and you find nothing but a stump surrounded by heavy equipment tracks. You call the police immediately, and they are able to locate a log similar to your tree at a local sawmill, where it will be cut into veneers that are worth thousands of dollars. The sawmill recorded the name of the logger who brought in the log, but the logger says that he cut the tree from a different location.



Is it possible to use molecular techniques to prove that the log at the sawmill was cut from the stump next to your garage?

1A. Background and resources

You go to your local agricultural extension service, and they put you in touch with a faculty member in the forestry department who has done some work with plant forensics. He tells you that determining the species of a plant is very different from identifying tissue from an individual specimen. For determination of a species, it is possible to use sets of species-specific primers that generate DNA fragments of a known size. However, for identifying an individual plant, a series of microsatellite sequences that vary in length must be used for DNA fingerprint analysis.

What informational tools do you need for this approach to be successful?

What lab procedures would be necessary to assess microsatellite sequences?

How is a fingerprint generated?

1B. Background and resources

Suppose that the faculty member already has developed a set of variable microsatellite DNA sequences from 200 black walnut trees in your county. This set of microsatellites is assessed using the stump, the log at the sawmill, a younger black walnut tree on your property, and two other local black walnut trees. A subset of the data is shown in the table below.

| Lengths of Microsatellites | | | | | |
|----------------------------|---------|---------|---------|---------|---------|
| Sample | DGA6 | XBW5 | NMS9 | PHV3 | KDS8 |
| Stump | 163 165 | 148 157 | 175 175 | 198 201 | 183 195 |
| Log | 163 165 | 148 157 | 175 175 | 198 201 | 183 195 |
| Other Tree | 165 171 | 148 160 | 175 175 | 198 201 | 181 195 |
| Local Tree 1 | 164 171 | 153 157 | 175 175 | 201 216 | 180 188 |
| Local Tree 2 | 161 172 | 157 160 | 175 175 | 195 201 | 183 188 |

Do these data convince you that the log at the sawmill was cut from the stump near your garage? Why or why not? If not, what information would convince you?

2. Assessing relatedness

You are curious about whether the tree that was poached is related to the younger black walnut tree on your property. If you assume that older tree is a parent of the younger tree, what might their microsatellite profiles look like? Fill in the blanks in the table below.

| Lengths of Microsatellites | | | | | |
|----------------------------|---------|---------|---------|---------|---------|
| Sample | CDS4 | WZY5 | LPG2 | WBA4 | MLA7 |
| Stump | 145 152 | 163 163 | 174 | 136 | 201 201 |
| Other Tree | 149 | 167 | 172 178 | 133 138 | 198 |