

# **Tree Breeding for Pest Resistance for the Next 50 Years: the Search for Cross Resistance?**

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## **Abstract**

Research activities aimed at developing resistance to pests (insect, pathogens, mammals) in forest trees can be documented back over 5 decades. While a substantial body of research has been published on resistances in forest trees, not much of this work has made its way into applied tree improvement programs. There are several reasons for this, e.g.: (i) a new or interesting incursion is noticed, and studies are developed that work on materials not related to a breeding program; (ii) adequate infection or artificial inoculation techniques are too expensive and a large enough population cannot be screened; and (iii) the genetic gain in resistance may not be silviculturally useful or effective. However, a few notable exceptions are present, and important lessons should be taken from our experiences over the last 50 years.

What has changed recently is the concern that pest and disease occurrences (with notable outbreaks) are increasing and are likely to continue to increase. Moreover, it might be difficult to know what particular disease or pest may become the new threat, particularly with climate change and the increased movement of goods around the world leading to the introduction of exotic pests. We can go about tree breeding, in a re-active approach, as we have for the past 50 years, hoping that a genetic option can be developed within one cycle of selection and testing; however, it is not uncommon for this to take a decade or more. At some point soon, funding agencies and managers will start asking how useful is pest resistance breeding as a strategic and viable option for future forest health and biosecurity programs. The other approach may be that we more aggressively look for situations of cross resistance against future 'classes of threats' rather than the traditional 'one-tree/one-pest' program(s) of the past. The risk we face here is that some pests (diseases in particular) will be quite host or genotype specific and we may provide no additional protection to future crops. While this is a risk, it seems that, particularly with a growing body of research showing that cross resistance is present, breeding trees which may have more 'durable' forms of resistance is probably a timely endeavor in forest tree breeding. At the very least, it should be seriously considered in particular programs.

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