

## **Plant breeding principles – Cobus Swanepoel**

Recently, some calculations I was struggling with took me back to literature published in the 1950's in my search for help. Either I had forgotten, or I never knew in the first place, but from my search, I noted that many of the genetic principles that we plant breeders use on a daily basis actually originate from studies on farm animals. And this reminded me of Prof Carel Roux who tried to teach us population genetics in our second year at varsity. His level of understanding of statistics was far greater than we could ever imagine, so we settled for understanding just a few principles instead. During a discussion with him on whether to choose plant breeding or animal breeding as a main field of study, he defaulted back to basic principles, saying "breeding comes down to bringing a sperm cell and an ovule together – whether it's in plants or animals is, to a great extent, irrelevant". Perhaps a little oversimplified, but it has always stuck with me. And so when breeding decisions start to get too difficult, I always try to fall back upon basic principles – many times we make things more complicated than what they are, or need to be.

Another principle from way back that has also stayed with me – instilled this time by Prof Hein Liebenberg – was that "you cannot breed a crop if you do not know the crop". I have been fortunate in that I have worked with Cucurbits for what is now 20 years, and can claim to have a decent understanding of cucurbit breeding. Many years ago though, like many a newly qualified graduate, I thought I knew considerably more than I actually did. Although I had awesome mentors, day-to-day decisions were left up to me – with no actual breeding experience and even less farming experience, the learning curve was a very steep one! What I would *not* change is the seemingly (at the time) "wasted" hours of doing everything myself: although I made some incredibly stupid decisions, I also was able to learn about my crop by looking, touching, smelling and tasting. Nothing teaches you to observe the number of spines on a plant like being scratched for weeks on end while pollinating, or the importance of flower position on a plant when harvesting zucchini fruits because you find yourself without a labour force. All of these experiences, and many similar, cannot be acquired by sitting behind a desk, and I find that I use these learnings each and every day in my breeding programme.

Of course, familiarity with your crop is just one factor in managing a breeding programme, there are many others involved as well: it's very important for instance, that breeding nurseries be managed in accordance with basic farming principles. If breeding plants are managed differently to those of commercial growers, selection could easily end up being for a trait the growers are not even interested in. As I said, I have been involved in the same breeding programme for many years and it has taken me across the full range of farm managers on farms throughout the country, and it is clear that standards with regard to irrigation, nutrition, crop protection and various other commercial practices are non-negotiable. Pathogens, especially, also play a pivotal role, but for many years disease resistance in cucurbits was mostly limited to viruses, and there I was fortunate enough to learn from expert virologists at the ARC. While developments in biotechnology and genetics in the last two decades have been mind-boggling, the fact that a decent ground work was laid down for me during my university years has made it possible to keep up to date with, and apply, new technologies. Although I do not claim to be an expert in either farm

management, pathology or biotechnology, I know enough to see where it fits into modern breeding, and so am able to identify results which do not make sense – which brings me to my next important principle: you do need to broaden your knowledge base widely, in order to understand your narrower breeding game.

I have also had the opportunity (and pleasure) over the last few years to spend considerable amounts of time with various young graduates. Out of curiosity, I recently asked them to describe what they saw as my breeding approach. Among other aspects, they listed my passion for breeding, my attention to detail, and my approach of collecting relevant opinions from others before making final decisions. That I am passionate about what I do is certainly correct – I never cease to appreciate the beauty of Cucurbit flowers, and I live out a quote I heard many years ago: “if you do what you love, you will never work a day in your life”. And I certainly do love working with plants – this is of course something inherent, and cannot be taught. Attention to detail while spending time with either your breeding material or data generated, is the only way in which the superior genotypes will be noticed, especially when everything seem the same. Making informed decisions should always be a part of the breeding process – a sound breeding and/or genetic background is of course needed, but in order to deliver a seed produceable variety that will be acceptable to the commercial pack-house manager and to the discerning housewife, many additional agricultural practices and the relevant opinions, are needed.

My advice for any young breeder: “keep it simple, but stay informed”.