The crossing of beans is a difficult and tedious procedure. This is due to the coiled nature of the keel, which encases both the male and female organs, ensuring natural self-pollination. Also, the species produces very little pollen, especially during the cooler seasons of the year when most pollinations are made. Consequently, a method is needed that keeps the stigma and available pollen in very close contact as long as possible, as does the keel in natural selfing.

Since the bean is protandrous, measures designed to prevent the stigma of the flower from being self-fertilized are usually taken through emasculation of the female bud just before the banner petal starts to open. Buishand (1956) described two procedures, the rubbing and hooking methods, which involve emasculation before pollination. By forcing the stigma of the female bud to protrude from the keel, a breeder can also use these two methods without emasculation. However, the rubbing method without bud emasculation does not preclude later selfing, since the stigma can recede into the keel after pollination. When the hooking method is used on an unemasculated female bud (the clamping method of Buishand), this prevents the stigma from receding into the keel after pollination, but the pressure applied to enforce protrusion of the stigma is often strong enough to injure the base of the keel and damage the style.

None of these pollination techniques provides the long period of close contact needed between the pollen and the stigma for maximally effective crossing in bean. We have found a new method which does meet this need. It is described here for the first time as the wrapping technique.

A female flower bud is emasculated as described by Buishand. Then, a freshly opened flower is picked from the desired pollen parent and the keel is carefully removed to expose the stamens and pistil. The stigma-style is easily pulled off with forceps. Still with the forceps, the stamens are severed from the ovary and securely wrapped around the stigma of the emasculated bud, making sure that the anthers are in direct contact with the stigma. When so positioned, the stamens cannot be dislodged, and even after pod formation the filaments can be seen loosely wound around the tip of the developing pod. This technique is so effective that we have had nearly 100% pollination success, a sharp contrast to the 30% and 70% success reported by Buishand for the rubbing and hooking methods, respectively.

References