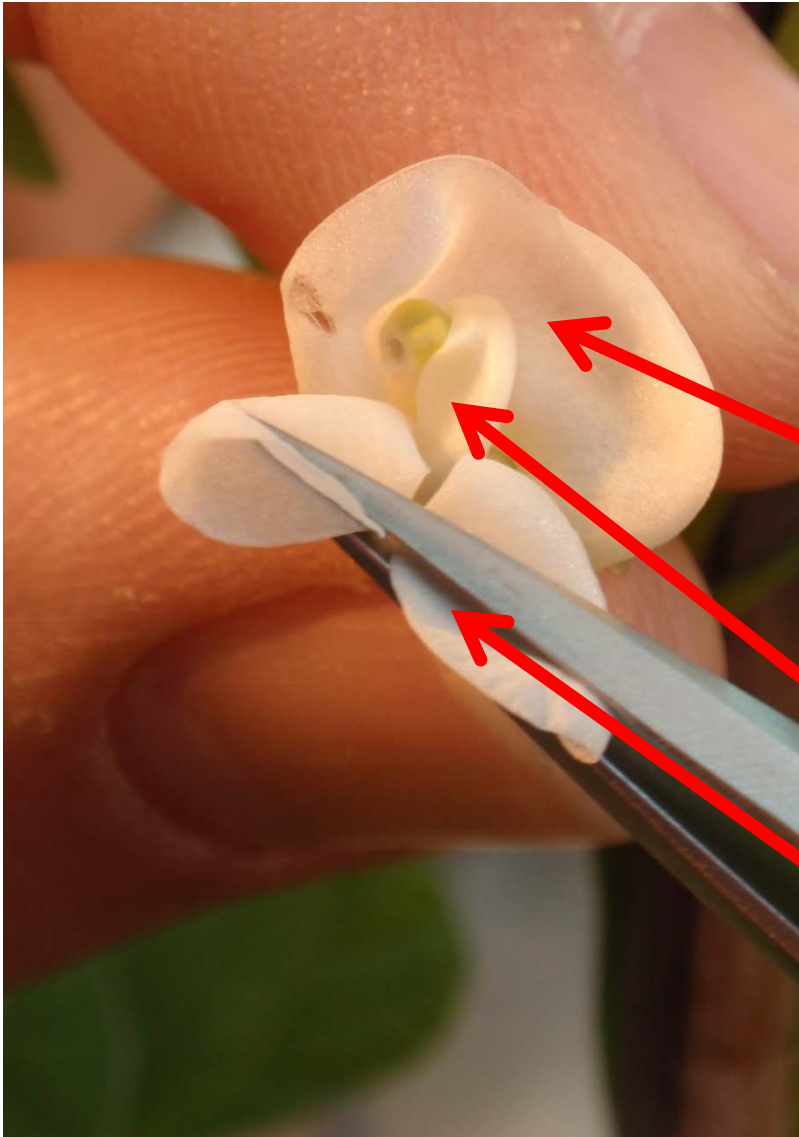


Crossing Dry Bean
(Phaseolus vulgaris)



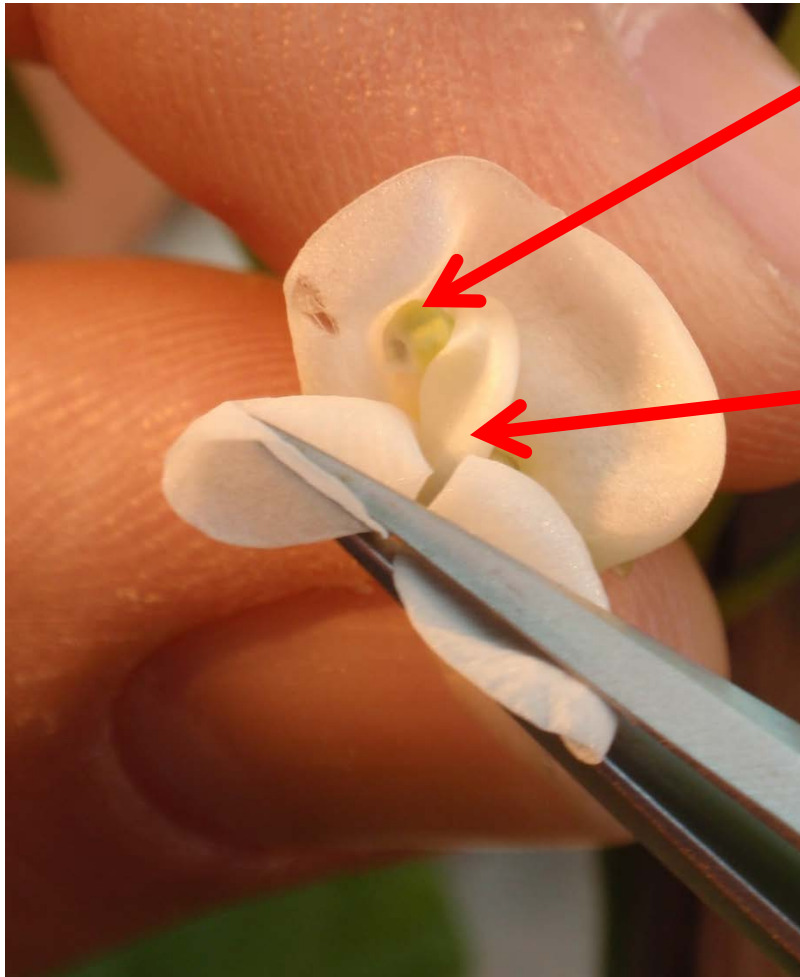
Dry Bean Breeding and Genetics Lab
Michigan State University
East Lansing, Michigan

Structures of the Bean Flower



- The dry bean flower is composed of five petals which are modified to perform specific functions.
- Standard (or banner petal)
-One
- Keel-Two
- Wings-Two

Structures of the Bean Flower (continued)



- The stigma and stamens are contained within the tube created by the keels.
- The ovary is at the base of the stigma
- At anthesis the anthers have already dehisced, and the flower is self-pollinated

First – Immature Female Bud



- Flower buds which will open in one or two days are selected on the female or pod parent.
- Once the flower begins to open, self-pollination has likely occurred.

Second- Pollinated Open Flower

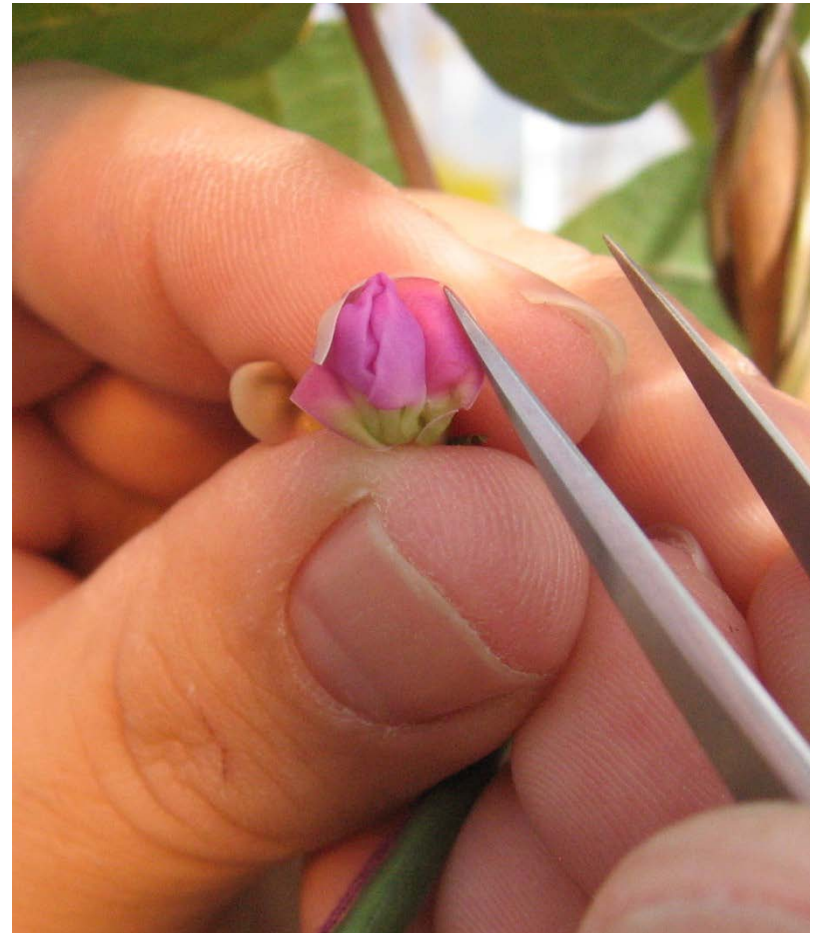


- Flowers which have opened the morning of making the cross are selected from the male or pollen parent.
- When the flower bud opens the anthers dehisce and the stigma moves past the anthers collecting pollen.

The Cross: Step One

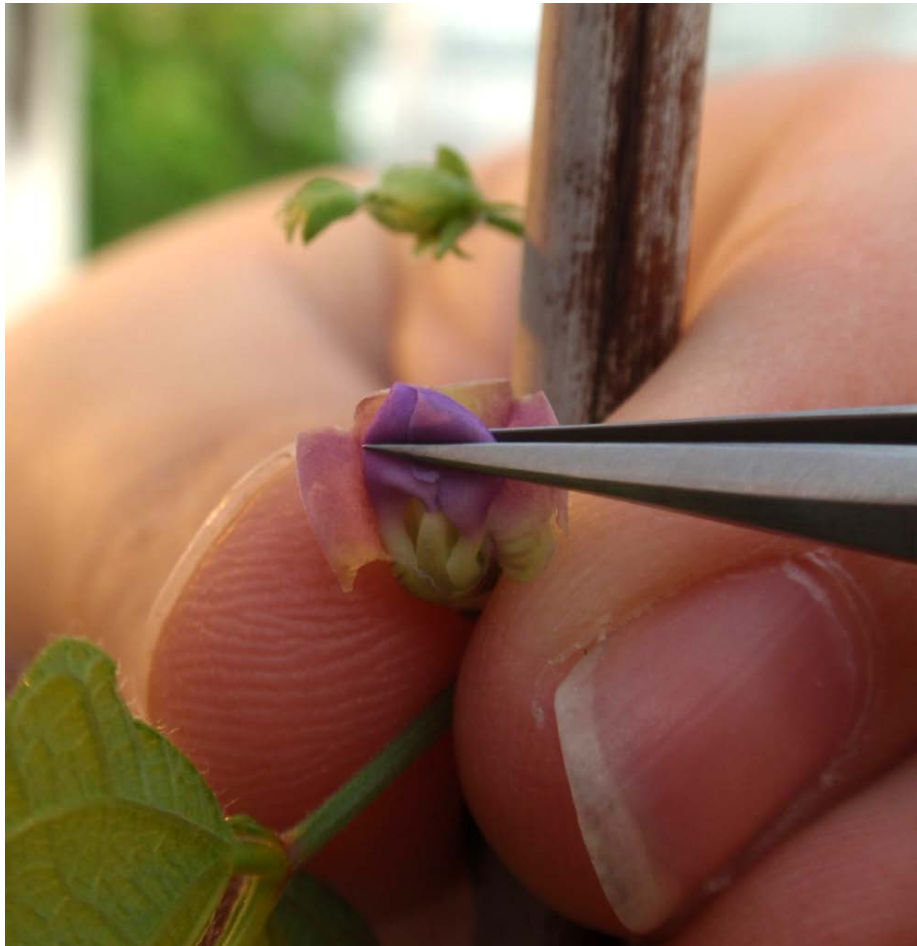
With forceps gently open the bud of the female parent by inserting the tip of the forceps between the edges of the standard petals.

Gently push the edges of the standard away to reveal the wing petals.



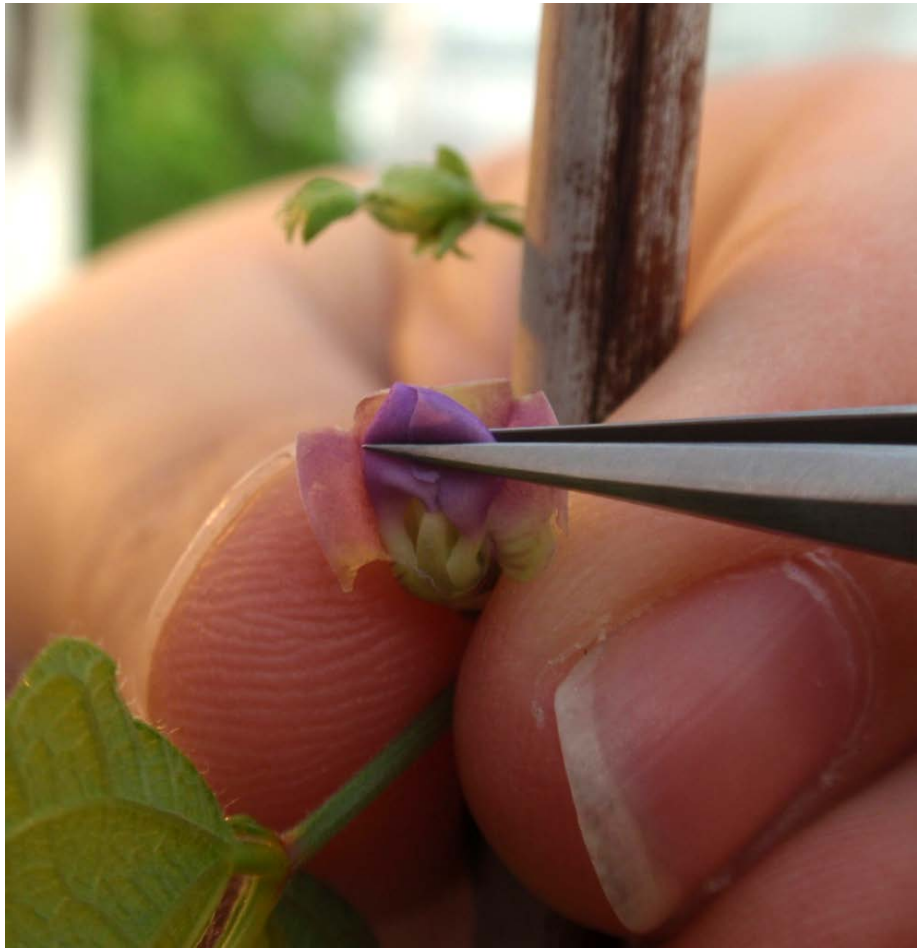
The Cross: Step Two (a)

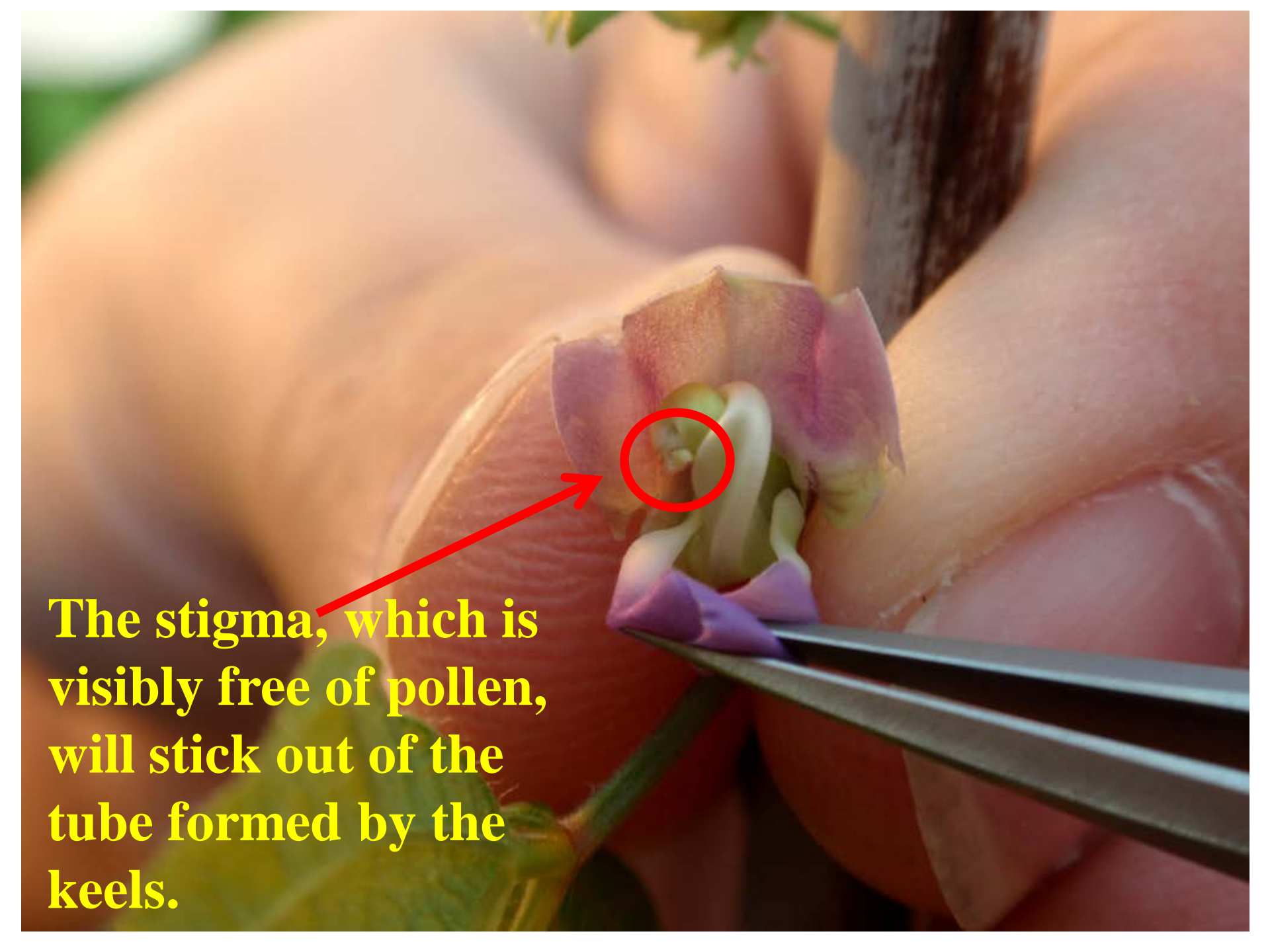
With forceps gently grab the wings and pull down. The stigma can be seen when it protrudes from the opening of the keels. Stamens may also protrude, these should be removed to avoid self pollination.



The Cross: Step Two (b)

To effectively trip the flower forcing the stigma out, the right hand wing petal is the best lever. Apply more downward pressure to the right hand wing petal to force the stigma out of the opening of the keels.

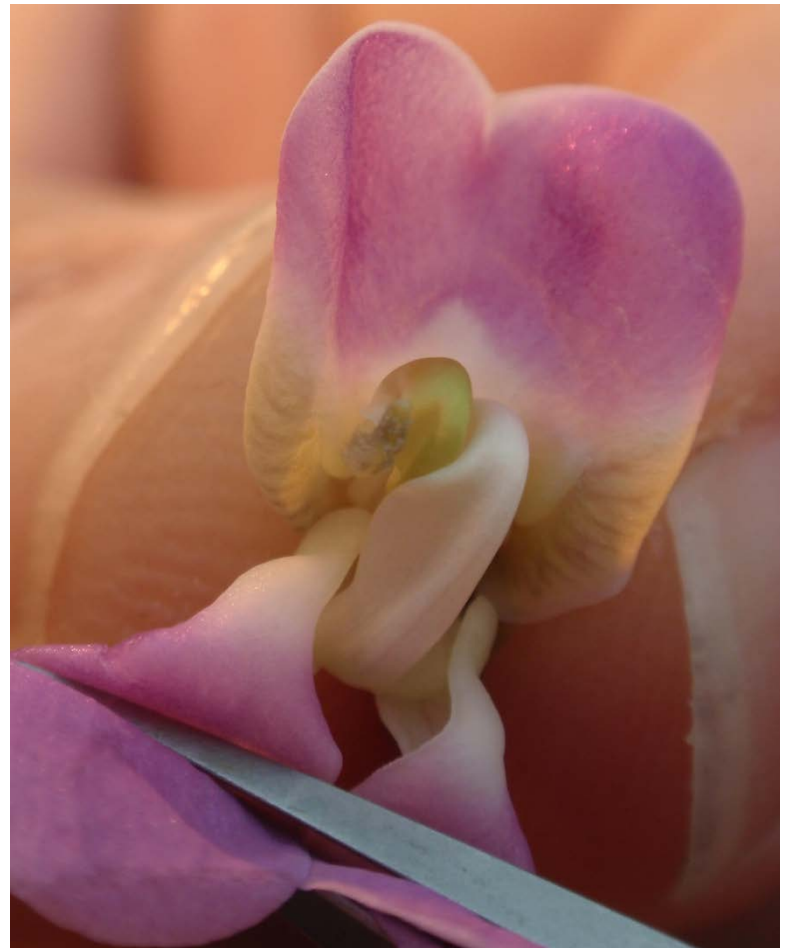


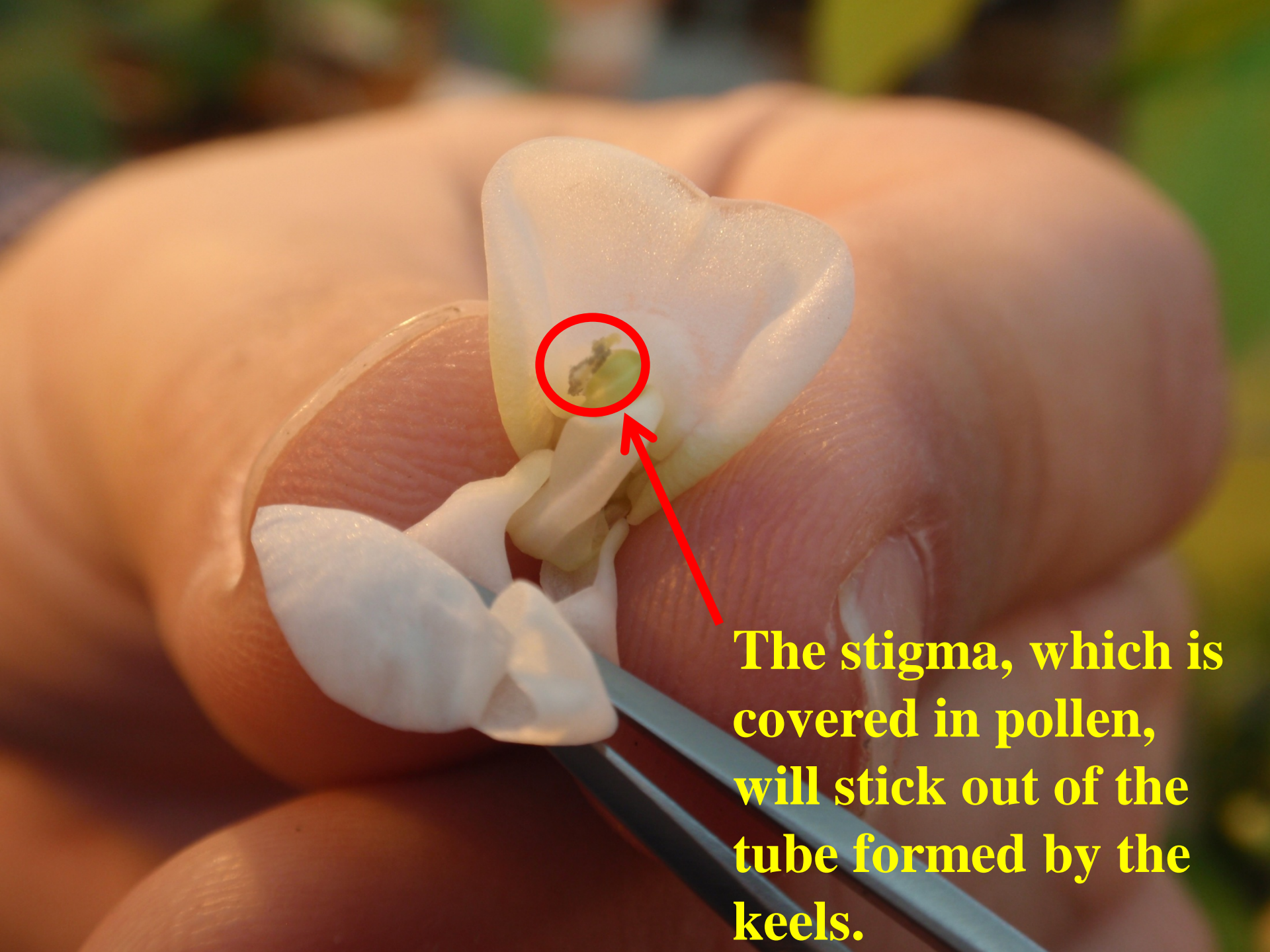


The stigma, which is visibly free of pollen, will stick out of the tube formed by the keels.

The Cross: Step Three – Pollen parent

With forceps gently grab the wings and pull down. The stigma can be seen when it protrudes from the opening of the keels. The stigma should be covered in the gray colored, grainy pollen. If pollen is not present, use a different open flower.





The stigma, which is covered in pollen, will stick out of the tube formed by the keels.

The Cross: Step Four

With forceps gently remove the stigma on the open flower. The stigma is used to transfer the pollen to the stigma of the bud being pollinated.



The Cross: Step Five (a)

Brush the pollen bearing stigma onto the pollen free stigma of the bud being pollinated. Then hook the pollen bearing stigma over the stigma of the bud being pollinated. The transferred stigma is left on the stigma of the flower being pollinated.



The Cross: Step Five (b)

If one is concerned with the amount and viability of the pollen being transferred, one can hook two pollen bearing stigmas on the exposed stigma of the female parent to ensure a successful pollination.



*arrows indicate pollen bearing stigmas

The Cross: Step Six

The most important step is to label the flower pollinated. Small jewelry tags are a good choice since they are small and will last until the pod is mature and harvested. Use a water fast pencil or marker. At a minimum, the tag should contain the pollen parent name or other identification.



Female Parent with 10 developing crosses (tagged pods);
To ensure that the crosses do not abort, all selfed pods and flowers should be removed. The two selfed flowers near the top of this plant will be removed to eliminate any competition with the developing hybrid seed in the tagged pods.
If selfed flowers/pods are not removed they can be confused with developing hybrid pods if the crossing tag is placed at the base of the peduncle

