



Almond pollination trials 2008

It is known that most almond varieties in the world, and all the major commercial varieties, are self incompatible, and each variety needs to be grown with another variety to ensure pollination. Each variety has specific incompatibility genes, and has to be grown alongside a variety with a different set of incompatibility genes. There is no way of predicting the composition of the Afghan germplasm in respect of incompatibility genes, so the various combinations of varieties have to be tested. Unless there is the information about the Afghan almond germplasm incompatibility systems genetic make up, it becomes impossible to base a modern industry on Afghan varieties.

The PHDP has collected some 99 clones. To test all the combinations for incompatibility, there would need to be nearly 10,000 individual crosses. There are many clones collected which have little immediate commercial value, so the work on testing incompatibility will be less than that. The work will also be easier when the germplasm is collected into the reference collections. However, due to the total lack of knowledge in the country about pollination compatibility, it was considered an urgent priority for PHDP, and a simple trial at three sites was designed, using the original in situ trees from which the budwood for the germplasm collection was collected. Three groups of six in situ trees were selected for their proximity in single orchards or in closely nearby orchards, in Khulm (Balkh province), in Aybak (Samangan province) and Kunduz.. Each tree was selected before flowering and lengths of branch with 100-200 flower buds were selected and marked. The lengths of branch used to donate or receive pollen were bagged using cotton muslin cloth to avoid ingress of bees or other pollinating insects. All the work was done using single in situ trees, so on each tree there were bags for ten sites to donate pollen of uncontaminated flowers, bags for ten sites to receive pollen from five other trees (including two replicates for each cross), bags for two sites for self pollination (two replicates), and two sites marked for natural pollination. So there were 24 treatments on each of 18 trees. Pollination, either self or cross pollination, was done on three successive days, to cover the period of flowering, by bringing flowers from the reserved branches to the receptor branches. Protective bagging was removed only to allow the hand pollination, until a few days after flower fall, when the protection was removed.

The structure of the trial was based on the hypothesis that all the varieties were self incompatible, so that any fruit set was due to the pollen transferred by the hand crossing. For each tree there was also two self pollination replicates, where the tree's own pollen was used to pollinate flowers. If there had been any self pollination, this would have invalidated the results of the crossing between different trees.

It was noted that the general level of fruit set on the control sections of branch was generally quite low. Hand pollination could increase the setting of fruit up to tenfold. This indicates a lot of problems with the current practices, probably mostly to do with the absence of pollinating insects. The condition of the flower bud after a very hard winter, the fertility status, the temperatures and humidity at flowering could all have an effect. Presentation of data to farmers and discussion with them indicates a lack of knowledge of the need for pollination which results in the deliberate killing of bees, as they think the bees eat the flowers. The same lack of knowledge about pollination has led some farmers to plant large areas to single varieties, with resulting nil crop.

The data obtained was variable. There were some unclear results, which are marked in the following tables. The basic criteria for a successful combination was fruit set with hand pollination equal to or higher than fruit set with natural background pollination. The criteria for a non-successful combination was fruit set equal or lower than that with self pollination. The low fruit set with natural pollination brought the boundary line between successful/unsuccessful cross to be too near, so there are a lot of doubtful. What is clear however, is that there must be quite a few different incompatibility genotypes among the Afghan almond germplasm, so the project can be quite confident, that in the absence of any specific data on varietal combinations, the planting of four different varieties (clones) will almost certainly give good fruit set. It should also be noted that there is no reason to think that these four different varieties could not all be different Sattarbai types.

Future work is provide information on the recommended combinations, to demonstrate the importance of pollination with bees, to ensure orchard growers understand the importance of planting mixtures of varieties, and taking remedial measures where they have single variety orchards. More combinations of varieties need to be tested for pollination compatibility, until recommendations can be made for all required commercial varieties

The following pages present summary results in the form of recommendations.

ALMOND POLLINATION CHART from 2008 trials (based on figures from second count)

Chart 1 - varieties tested in Khulm

Pollen variety	Qambari 143	Bellabai 144	Sattarbai Sufi 145	Zang Kaftar 148	Sattarbai Bakhmali 149	Sattarbai No.4 154
Seed variety						
Qambari 143	o	y	y	?	y	O
Bellabai 144	yyy	o	yy	y	o	?
Sattarbai Sufi 145	yy	y	o	y	y	?
Zang Kaftar 148	y	?	?	O?	?	?
Sattarbai Bakhmali 149	y	o	y	o	o	y
Sattarbai No.4 154	?	y	?	y	o?	o

Key: y =yes, good pollination; ?= not clear cut, intermediate results: o = no pollination

Results are not always clear cut, the trees set very low percentages with natural pollination

Good combinations in an orchard - two varieties pollinize each other

Bellabai 144 & Qambari 143

Sattarbai Sufi 145 & Qambari 143

Bellabai 144 & Sattarbai Sufi 145

Sattarbai Bakhmali 149 & Sattarbai Sufi 145

Sattarbai Bakhmali 149 & Qambari 143

Possible combinations - more data needed - use 3 rows first variety, 1 row second variety

Zang Kaftar 148 & Qambari 143

Sattarbai Sufi 145 & Zang Kaftar

Sattarbai Bakhmali 149 & Sattarbai No 4 -154

Sattarbai No 4 154 & Bellabai 144

Bad combinations -should not be planted

Sattarbai Bakhmali 149 & Bellabai 144

Sattarbai Bakhmali 149 & Zang Kaftar 148

Qambari 143 & Sattarbai No.4 -154

Generally good pollinizer

Qambari 143

Generally poor pollinizers

Sattarbai Bakhmali 149

Sattarbai No 4 (one exception)

ALMOND POLLINATION CHART KUNDUZ

The information from this trial is generally disappointing. Fruit set was low in the orchards, but occasionally there were some interesting results

Good combinations in an orchard - two varieties pollinize each other

Abdul Wahidi 1003 & Qaharbai 170

Other comments

The variety Carmel 167 was too late flowering to be of use with the local varieties and Nonpareil 171.

Nonpareil 171 was pollinated by Abdul Wahidi 1003, but the reverse cross had nil pollination

Chart 2 - varieties tested in Aybak

Pollen variety	Sattarbai Sais 156	Sattarbai Guldar 157	Sattarbai Bakhmali 159	Qaharbai 160	Kheirodini 161	Shokurbai 162
Seed variety						
Sattarbai Sais 156	o	yy	yy	yy	yyy	y
Sattarbai Guldar 157	o	o	o	o	o	o
Sattarbai Bakhmali 159	y?	y?	o	Y?	yy	y?
Qaharbai 160	y	yy	yy	o	y	y?
Kheirodini 161	y	yy	y	y	o	y
Shokurbai 162	y?	o	y?	Y?	y?	o

Key: y =yes, good pollination; ?= not clear cut, intermediate results: o = no pollination

Results are not always clear cut, the trees set very low percentages with natural pollination

Good combinations in an orchard - two varieties pollinize each other

Sattarbai Sais 156 & Qaharbai 160

Sattarbai Sais 156 & Kheirodini 161

Sattarbai Bakhmali 159 & Kheirodini 161

Qaharbai 160 & Kheirodini 161

Possible combinations - more data needed - use 3 rows first variety, 1 row second variety

Sattarbai Sais 156 & Sattarbai Bakhmali 159

Qaharbai 160 & Sattarbai Bakhmali 159

Kheirodini 161 & Shokurbai 162

Bad combinations -should not be planted

Shokurbai 162 & Sattarbai Guldar 157

Other comments

Sattarbai Guldar 157 set almost no flowers with open or hand pollination, so was very unproductive.

Shokurbai 162 set much less flowers with hand pollination than with natural pollination and this made results difficult to assess. Generally hand pollination improved fruit set two or three times.