development and delivery of ecologically-based IPM packages for CENTRAL ASIA

regional program: tajikistan

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Central Asia

program summary

For wheat production in Tajikistan, 2012 was generally a favorable year. Yellow rust was first observed on May 28-30 with up to 30% infection on susceptible wheat varieties but little to no infection on resistant varieties. Brown rust was apparent by mid-June in irrigated areas and, by harvest, had reached a maximum of 70-80% infection on susceptible local wheat varieties including Navruz, Sharora. In contrast, the resistant Ormon variety only reached 10% infection. Due to the late infection of brown rust and lack of progression of yellow rust infections, the overall impact of these diseases on wheat yield was minimal.

Sunn pest pressure continued to be high in northern Tajikistan where it is a consistent pest. While the sunn pest can occasionally be found in the southern and eastern regions, populations remained quite low in 2012. In contrast, the cereal leaf beetle is absent in the north, but populations were moderate to high in the southern and eastern regions.

The Tajikistan potato project was designed to evaluate modern potato varieties/lines with pest resistance under Tajikistan's and Central Asia's growing conditions. This research was designed as a two-step process, with the first year dedicated to documenting the agronomic properties of both the pest resistant and local varieties/lines. The second phase is to evaluate the varieties-lines under specific sets of pest pressures, with special reference to the golden nematode, Colorado potato beetle, late blight, and potato scab.

Although potatoes are a very important crop in Tajikistan and often referred to as the "second bread," potatoes are a relatively recent crop in Tajikistan. They were first introduced to the country about 150 years ago. Because of the dynamics of pre-, during, and post-Soviet times, there is an extremely limited modern agronomic or IPM research base in relation to potato production in Tajikistan. The team established two potato IPM applied research and demonstration sites in Tajikistan in 2012, one in the low land and the other, mountainous.

TAJIKISTAN

Wheat

IPM packages for wheat and potato cropping systems in Tajikistan

All of the sites focused on: the cereal leaf beetle (*Oumela melanopa)*; diseases, including yellow rust (*Puccinia striiformis*) and brown rust (*Puccinia recondite*); and key weeds, including oat grass (*Avena fatua*), shepherd's purse (*Capsella bursa-pastoris),* pigweed or lambsquarters (*Chenopodium album)* and bermuda grass (*Cynodon dactylon*). In collaboration with local agriculture ministries, local NGOs, and universities, farmers field schools were also held, and information on these can be found in the short-term training section.

North Tajikistan Site: Ujteppa village, Tagoyak Jamoat of the Spitamen district, Sogd region.

This demonstration site was located on Ilhom Boimatov farm, owned by Mr. Akmal Boimatov. The following IPM package components were compared to local farmers' practices in the same area:

- Plots of 10 X10 m planted with a variety resistant to yellow and brown rusts; 4 replications with two strips of flowering plants including coriander *(Coriandrum sativum L.)*, dill *(Anethum graveolens L.),* sweet basil *(Ocimum basilicum L.),* ziziphora *(Ziziphora interrupta* Juz.), marigold *(Calendula officinalis L.)* and winter cress (*Barbarea vulgaris)* alongside the wheat plots to enhance sunn pest egg parasitoids,
- Cultural practices (planting date, seed rate, fertilizer application, and weed control),
- Hand collection of sunn pest adults over 2-3 weeks, beginning at the time of migration to wheat fields.

Other Farmer Participants: (n=20)

Date of demo establishment: October 24, 2011

Date of rust evaluation: May 17, 2012

Date of Sunn pest evaluations: April 19 and May 17, 2012

Figure 1.Farmers during field training in Spitamen district

Date of yield evaluation: June 15, 2012

Seed sowing rate: 2 kg per plot or 200 kg/ha

Farmer variety: "Ulugbek"

IPM Demo Variety: "Ormon"

Treatments: In the IPM practice, the wheat seeds were treated with "Vitavaks 200 FF" at 2 kg per ton wheat seed.

Yellow rust infection in May was low to moderate, averaging 37.5% in the farmer practice plots and 5% in the IPM demo plots. Brown rust infection in May was low to moderate, averaging 30% in the farmer practice plots and 5% in the IPM demo plots. Sunn pest pressure was low to moderate and increased from April to May. Combined counts of sunn pest adults and larvae in April averaged 3.5 per m^2 in farmer practice plots versus 1.5 per m^2 in IPM demo plots; in May, counts averaged 6.8 per m^2 in farmer practice plots versus 3.0 per m^2 in IPM demo plots.

Table 1. The results of farmer practice and IPM package treatments on sunn pest damage and wheat yield, North Tajikistan, 2011-12*

	Mean ± SEM number of sunn pest damaged heads/m^2	**Mean ± SEM yield of wheat from plots (kilogram)**
Farmer practice	7.0 ± 0.71 a	30.75 ± 0.96 a
IPM package	2.3 ± 0.25 b	52.05 ± 0.56 b

*Values within the same column followed by different letters are significantly different at the P<0.001 level, T-test.

South Tajikistan Site: Andrevka village, Hissor district, Hissor region

This demonstration site was located at the farm of Mrs. Makhbuba Sattorova. The following IPM package components were compared to local farmers' practices in the same area:

- Plots of 10 m x 10 m planted with a variety resistant to yellow and brown rusts, four replications with two strips of flowering plants, including coriander (Coriandrum sativum L.), dill (Anethum graveolens L.), sweet basil (Ocimum basilicum L.), ziziphora (Ziziphora interrupta Juz.), and marigold (Calendula officinalis L.), alongside the wheat plots to enhance cereal leaf beetle natural enemies,

- Cultural practices (planting date, seed rate, fertilizer application, and weed control),
- Biopesticide application of "Nim" (a Neem product from China) targeted to control cereal leaf beetle.

Other Farmer Participants: (n=20)

Date of demo establishment: December 16, 2011

Date of rust evaluation: May 28, 2012

Date of CLB evaluations: April 14 and May 12, 2012

Date of yield evaluation: June 19, 2012

Seed sowing rate: 2 kg per plot or 200 kg/ha

Farmer variety: "Norman"

IPM Demo Variety: "Ormon"

Treatments: In the IPM practice, the wheat seeds were treated with "Vitavaks 200 FF" at 2 kg per ton wheat seed.

Yellow rust infection in May was low to moderate, averaging 25% in the farmer practice plots and 0% in the IPM demonstration plots. Brown rust infection in May was low, averaging 15% in the farmer practice plots and 1.3% in the IPM demonstration plots. Cereal leaf beetle pressure was moderate and increased from April to May. Combined counts of cereal leaf beetle adults and larvae in April averaged 9.3 per m^2 in farmer practice plots versus 6.0 per m^2 in IPM demo plots; in May, counts averaged 14.8 per m^2 in farmer practice plots versus 10.0 per m^2 in IPM demo plots.

Table 2. The results of farmer practice and IPM package treatments on cereal leaf beetle damage and wheat yield, southern Tajikistan, 2011-12*

	Mean ± SEM number of CLB damaged leaves/m^2	**Mean ± SEM yield of wheat from plots (kilogram)**
Farmer practice	10.5 ± 0.96 a	30.25 ± 1.10 a
IPM package	2.3 ± 0.25 b	40.45 ± 1.04 b

*Values within the same column followed by different letters are significantly different at the P<0.001 level, T-test.

Overall, cereal leaf beetle damage was significantly lower in the IPM demonstration plots than in the farmer practice plots. Each of the yield components were higher in the IPM wheat package plots, resulting in a 25% increase in final yield (from 30 to 40 kg/plot). A report on the results was presented to the farmers and the Research Institute of Farming and will be shared at subsequent grower meetings.

East Tajikistan Site: Muminabad district, Khatlon region

This demonstration site was located at a private farm of Mr. Haidar Rakhimov. The following IPM package components were compared to local farmers' practices in the same area:

- Plots of 10 m x 10 m planted with a variety resistant to yellow and brown rusts, four replications with two strips of flowering plants, including coriander *(Coriandrum sativum L.)*, dill *(Anethum graveolens L.),* sweet basil *(Ocimum basilicum L.),* ziziphora *(Ziziphora interrupta* Juz.), and marigold (*Calendula officinalis L.)* alongside the wheat plots to enhance the cereal leaf beetle's natural enemies.
- Cultural practices (planting date, seed rate, fertilizer application, and weed control).

Other farmer participants: (n=15)

Date of demonstration establishment: December 5, 2011

Date of rust evaluation: June 1, 2012

Date of CLB evaluations: April 28 and May 31, 2012

Date of yield evaluation: June 30, 2012

Seed sowing rate: 2 kg per plot or 200 kg/ha

Farmer variety: "Norman"

IPM demonstration variety: "Ormon"

Treatments: In the IPM practice the wheat seeds were treatment by "Vitavaks 200 FF" at 2 kg per ton wheat seed

Yellow rust infection in May was low to moderate, averaging 30% in the farmer practice plots and 4.5% in the IPM demonstration plots. Brown rust infection in May was low, averaging 15% in the farmer practice plots and 4% in the IPM demonstration plots. Cereal leaf beetle pressure was moderate and increased from April to May. Combined counts of cereal leaf beetle adults and larvae in April averaged 5.5 per m^2 in Farmer Practice plots versus 6.0 per m^2 in IPM Demo plots, while in May, counts averaged 12.0 per m^2 in both Farmer Practice and IPM Demo plots.

Table 3. The results of farmer practice and IPM package treatments on cereal leaf beetle damage and wheat yield, East Tajikistan, 2011-12*

	Mean ± SEM number of CLB damaged leaves/m^2	**Mean ± SEM yield of wheat from plots (kilogram)**
Farmer practice	9.8 ± 0.63 a	30.75 ± 0.96 a
IPM package	5.8 ± 0.25 b	38.20 ± 0.64 b

*Values within the same column followed by different letters are significantly different at the P<0.001 level, T-test.

Overall, cereal leaf beetle damage was significantly lower in the IPM demonstration plots than in farmer practice plots. Each of the yield components were higher in the IPM wheat package plots, resulting in a 26% increase in final yield (from 28 to 38 kg/plot) in wheat yield in the IPM package plots. A report on the results was presented to the farmers and the Research Institute of Farming and will be shared at subsequent grower meetings.

Potato

Dr. David Douches (MSU), Dr.Walter Pett (MSU), Dr. Nurali Saidov (Tajikistan) and Dr. Anwar Jalilov

Ten varieties/lines were evaluated for tuber productivity at both locations. The varieties/lines were selected based on the results of the 2011 research in Kyrgyzstan. Eight of the varieties/lines used in the 2012 research represent germplasm with resistance to golden nematode, late blight, potato scab, and Colorado potato beetle, while the other two are commonly grown, local varieties (tab. 4).

Table 4. Potato varieties/lines and IPM characteristics

#	Variety/ Line	IPM Characteristic
1	Boulder	Golden nematode resistant
2	Missaukee	Golden nematode resistant
3	Dakota Diamond	Colorado potato beetle tolerant
4	Kalkaska	Scab resistant
5	MSP270-1	Scab resistant
6	MSQ176-5	Late blight resistant
7	MSL268D	Late blight resistant
8	MSM182-1	Late blight resistant
9	Cardinal - Taj-1	Local variety No. 1
10	Picasso - Taj-2	Local variety No. 2

Table 5. Total harvested potato yield (kg)

#	Variety/ Line	Total - kg	Mean (kg)
1	Boulder	7.8	3.9
2	Missaukee	6.5	3.25
3	Dakota Diamond	9.5	4.75
4	Kalkaska	8.3	4.15
5	MSP270-1	5.1	2.55
6	MSQ176-5	4.6	2.3
7	MSL268D	4.3	2.15
8	MSM182-1	5.4	2.7
9	Cardinal - Taj-1	3.4	1.7
10	Picasso - Taj-2	2.2	1.1

The first trial was conducted in the Irgatol District, Jamoat Muksu, Tupi Boiho Village and planted on May 12, 2012. Pest population densities were monitored and were relatively low throughout the growing season. All of the varieties/lines sent to Tajikistan performed well for agronomic characteristics at the Irgatol location. The tubers were harvested on September 24, 2012 (tab. 5). All of the varieties/lines evaluated yielded more (mean yield = 3.2 kg/plot) than the local varieties (mean yield = 1.4 kg/plot). The results of this trial form a solid foundation for designing potato pest management specific variety/line research and demonstration trials in Tajikistan in 2013, to be conducted under specific pest population density pressures. The second 2012 Tajikistan potato trial will be harvested during the last week of October.