USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**NA**
Agreement Title:	**Transfer of Scab Resistance from Wild Relatives into Durum Wheat.**
FY05 ARS Award Amount:	**$ 27,000**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
GIE	Transfer of Scab Resistance from Wild Relatives into Durum Wheat.	$ 27,000
	Total Award Amount	**$ 27,000**

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Principal Investigator Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

Project 1: *Transfer of Scab Resistance from Wild Relatives into Durum Wheat.*

1. What major problem or issue is being resolved and how are you resolving it?

FHB resistance is almost non existent in durum wheat cultivars. Wild relatives, in the tertiary gene pool, are excellent sources of resistance. We are attempting to transfer this resistance from two diploid wild grasses, *Lophopyrum elongatum* and *Thinopyrum bessarabicum*, into durum wheat utilizing wide hybridization combined with manipulation of chromosome pairing. We are using fluorescent genomic in situ hybridization (fl-GISH) to characterize the alien chromatin integrated into the wheat genome.

2. List the most important accomplishment and its impact (how is it being used?). Complete all three sections (repeat sections for each major accomplishment):

Accomplishment:

Through a series of backcrossings and selfings, we were able to produce numerous fertile hybrid derivatives with alien chromatin from the wheatgrasses integrated into the durum genome that we confirmed by fluorescent GISH analyses. These hybrid derivatives were promising from the standpoint of FHB resistance but the alien chromatin integration was not stable and was lost in subsequent generations.

We, therefore, produced monosomic additions and some substitutions. The monosomic additions for *Lophopyrum elongatum* chromosomes were not stable, as expected. The single alien monosome was eventually lost because it did not have a partner to pair with. We went on to produce disomic additions involving *L. elongatum* chromosomes. These additions were not only stable but also several of them had high resistance to FHB. They had 7 to 14 % infection, compared to 70 to 100 % in the parental cultivars. After at least three screenings in the greenhouse, we tested selected disomic additions in the Scab Screening Nursery at Prosper, ND, and confirmed their FHB resistance. We have multiplied the seed of promising disomic additions. Recently, we ran the chromosome-specific markers on these additions and found that chromosome 1E is involved in all of them.

We have also produced monosomic additions for three different *Th. bessarabicum* chromosomes. Work on the production of disomic additions is in progress.

Impact:

We have produced for the first time a disomic addition lines in durum that have resistance to FHB. Have also shown that chromosome 1E of *L. elongatum* is involved in all these additions. This will facilitate production of durum germplasm with FHB resistance by transferring appropriate segments from the alien chromosome into the durum genome.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

The first disomic addition with FHB resistance we have produced is being released for the use of scientific community to do basic and applied research on FHB resistance.

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Jauhar, P.P., and Satyavathi, V.V. 2005. Efficient in vitro regeneration will more effectively facilitate genetic transformation of durum wheat. *Science in Action***:** An electronic newsletter for practicing professionals. Crop Science Society of America, Madison, Wisconsin.

Jauhar, P. P., and Peterson, T.S. 2006. Cytological analyses of hybrids and hybrid derivatives between durum wheat and *Thinopyrum bessarabicum*, using multicolor fluorescent GISH. Plant Breeding 125**:** 19-26.

Jauhar, P.P**.** 2006. Modern biotechnology as an integral supplement to conventional plant breeding**:** The prospects and challenges. Crop Science 46: 1841-1859. (Invited symposium paper)

Jauhar, P.P. 2006. Cytogenetic architecture of cereal crops and their manipulation to fit human needs: Opportunities and challenges. In**:** *Genetic Resources, Chromosome Engineering and Crop Improvement*, *Volume 2: Cereals*. CRC Taylor & Francis Press, Boca Raton, FL, USA., pp. 1-25.

Ceoloni, C., and Jauhar, P.P. 2006**.** Chromosome engineering of the durum wheat genome: Strategies and applications of potential breeding value. In**:** *Genetic Resources, Chromosome Engineering and Crop Improvement*, *Volume 2: Cereals.* CRC Taylor & Francis Press, Boca Raton, FL, pp. 27-59.