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**Summary:** A two-year study is underway to evaluate yield potential, adaptation, and end-use quality of OSU winter durum lines. The goal is to identify specific production areas, N requirements, and management systems conducive to produce high quality winter durum as an alternative to soft white winter wheat. Seven winter durum lines, including 'Connie', and Stephens were grown over 6 locations in 1999-2000, and planted the same sites for evaluation in 2001. Three N levels were applied, adjusted for the yield potential at each location. The rates were based on theoretical expectations of N needed to: 1) produce SWW with 10% grain protein; 2) produce 13% durum at the same yield level as SWW; and 3) produce 13% durum plus an additional 25% added N. In 2000, Stephens significantly out-yielded the durum experimental lines by an average of over 10 bu/a. However, at four locations the durum lines had grain yields very comparable to Stephens. Considering the premium price for durum grain, grain yields at 90% of Stephens would likely be acceptable and profitable for growers. The goal for marketing high quality durum is a grain protein content of 13.0 to 13.5%. Grain proteins ranged from under 9.0% to over 15.5%, depending on the location and N rate. At three of the six locations, average grain proteins over 13.0% were achieved with N treatment #2. However, at the other three locations, durum proteins did not exceed 12.5% even at the highest N level. Durum production may be a viable alternative for Oregon growers, but additional research on fertilization and management systems will be critical to produce consistently high quality grain. The grain from the 2000 field trials is currently in the California Wheat Commission laboratory for complete evaluation of grain quality, end-use properties, and pasta quality.

**This Month's Article:** The article reviews history and status of the OSU winter durum breeding effort and discusses market opportunities and challenges for establishing durum production in Oregon.

# Durum Wheat Varieties for Oregon and the Northwest



When you think of durum wheat production, you generally think of the desert Southwest, the northern Plains, or the Canadian prairie. So why would, or should, there be any interest in growing durum wheat in the PNW? A check of recent commodity prices can provide a simple answer. With soft white wheat hovering just under \$3.00 per bushel this winter, durum prices have been over \$5.00. Beyond price, however, there are several advantages in quality and proximity that are attractive to the durum processing industries. The PNW is well recognized for producing high quality grain, with low moisture, low ash content, higher test

weight, and large seed size. The low ash content is of particular value to durum millers, allowing higher semolina extraction rates with improved pasta color. For buyers in the PNW, Japan, and others in the Pacific Rim, it would mean access to durum at reduced transportation costs compared with moving grain out of the upper Midwest. US durum production has declined, related in part to phytosanitary concerns and increasing incidence of Fusarium head scab in the Midwest, and is now insufficient to meet domestic needs. For PNW growers, durum could be attractive as an 'alternative' or 'value-added' cereal crop and create new market opportunities.

So, why hasn't the PNW already developed as a major durum wheat growing area? There has been limited spring durum production, a spill-over from the desert Southwest. However yields of spring durum varieties have been inconsistent and are not competitive when compared with high yielding, disease resistant, soft white winter wheats. Winter durum varieties, with inherently higher yield potential, could be a more appropriate fit for cereal producers in the PNW. Countries such as Hungary, Romania, and the Ukraine have had active winter durum breeding programs for many years, but their cultivars have relatively poor processing quality and are not well adapted to the PNW. Of greater concern, however, is whether PNW growers can consistently meet grain protein specifications with durum produced under our high-yield conditions. Grain protein of 13.0% is considered minimum for durum marketing and processing and there are currently few outlets, other than feed, for grain under 12.5% protein.

With the financial support of Pendleton Flour Mills and Quaker Oats from 1988 to 1997, Dr. Warren Kronstad directed a modest winter durum breeding and genetics effort at OSU. The goal was to combine the superior pasta quality of spring durum varieties with the winterhardiness, high yield, and disease resistance of winter durums from Eastern Europe. The program came to fruition in 1997-98 with the exclusive release of 'Connie' winter durum to Pendleton Flour Mills. Connie was found to have superior protein quality for pasta and grain yield potential comparable to Stephens. In 1998, with additional funding from Pendleton Flour Mills, Dr. Karim Ammar joined the OSU faculty as the Durum Wheat Breeder. Involved with



*Combining of durum plots in Pendleton last summer*

durum research as a PhD student of Dr. Kronstad's, Dr. Ammar quickly developed a large germplasm base and breeding program to develop improved durum varieties.

Just as several thousand acres of Connie were brought into production in 1998-99, a winter cold-snap revealed that the variety had marginal levels of cold hardiness for Oregon conditions. In addition to loss of nearly all production acres of Connie, nearly  $\frac{3}{4}$  of the OSU winter durum breeding stocks were damaged from the cold temperatures. While beneficial in breeding more cold-tolerant durum varieties, it was a certainly a setback for production, marketing, and market development.

Changes in business plans and other economic concerns led to a reduction in support from Pendleton Flour Mills in 1999-2000. With future of the durum program now in doubt, the Oregon Wheat Commission stepped in and provided financial support, along with 1-year funding from the Oregon Economic and Community Development, to insure that progress made to-date would not be jeopardized. Uncertainties regarding the durum effort were further increased when Dr. Karim Ammar was forced to return to Tunisia in May, 2000, due to obligations associated with his work visa. Karim's departure, and loss of his scientific expertise and breeding skills,

was a significant loss to OSU and the Oregon wheat industry.

The winter durum breeding effort was folded back into the OSU Wheat Breeding and Genetics Program on Karim's departure. Rather than hire another breeder with uncertainty of future funding and market opportunities, a technical support position was added to cover the additional workload. Financial support is currently being provided through the Oregon Wheat Commission and Pendleton Flour Mills.

Our immediate challenge was to pick-up where Dr. Ammar left off. After the 1998-99 field trials, it was obvious that many of the advanced experimental lines also lacked sufficient winterhardiness. This also means a replacement for Connie is still a few years away. However, Karim developed a large base of germplasm and populations that have shown superior winterhardiness, improved quality, and disease resistance traits. Screening and selection for winterhardiness, protein quality, and pigment color are continuing as our first priorities. The next goal is to understand fertilization and management needs for durum and identify production areas that can consistently produce high quality, high protein durum. A two-year multilocation

research study was developed, involving field trials of durum varieties grown at six locations in eastern Oregon at varying N levels, followed by extensive end-use quality and pasta analyses. The study will give us many insights into the appropriate production areas, N fertilizer rates, cultivar performance and response, processing quality, and management practices needed for optimal Durum production.

So, are there durum wheats in your future? Possibly. There are significant market opportunities for PNW grown durum if we can develop winterhardy, high-yielding, and high-quality winter varieties. It will, of course, require time, resources, and industry commitment. Are there chances for higher economic returns as compared to producing soft white wheat? Certainly. However, there are also risks associated with production and marketing. At this time, durum wheat is not included in LDP and Federal crop insurance programs for the PNW. Are there management and marketing issues yet to be resolved? Definitely. We need additional research and experience in order to consistently produce high protein, high quality durum. Will the research and development investments pay off? Stay tuned...



*Durum rows shortly after heading.*