

red wheat. Producers received premiums for hard white where it was appropriate and processors used the hard white primarily without incident. In addition to the 2001 environmental effect on color, the Hard White wheat market has been impacted by the introduction of many new varieties released by both public and private breeding programs. GIPSA proposes to amend the U.S. Standards for Wheat to better reflect the current and future needs of the Hard White wheat market.

The specific issues for consideration in this rule are (1) designation of subclasses in the class hard white, and (2) amending the definition of Contrasting Classes in hard red wheat classes. While proposing to amend the standards due to Hard White Wheat issues, GIPSA will also propose to include language in the standards which states the amount of wheat within which sample grade factors are determined. This action is proposed to help clarify the application of the standards for U.S. Sample Grade factors.

1. Subclass Designation

Under Program Notice 01-06, "All hard white wheat varieties are considered hard white wheat regardless of color." A common conception is that the domestic milling industry will accept any hard white regardless of seed coat color. This may or may not be true depending on which milling company is being interviewed. Discussions with some U.S. millers led to the conclusion that some millers do consider seed coat color when making purchase and processing decisions. Some milling companies do not yet process much Hard White wheat, thus have few concerns about bran color, and feel if darker Hard White wheat processes well and has acceptable protein content, there is no perceived problem due to bran color.

Depending on the target flour product and the miller's flour extraction goal, the darker colors can present processing challenges. For some high extraction rate flours, darker seed coat color anticipated darker flour color hence final product color problems, requiring millers to add additional bleaching agents and/or cut flour streams in order to meet final product specifications. These processes add additional production costs.

In addition to the domestic millers' position, marketing of Hard White wheat to export customers must be considered. Currently there is interest in Hard White wheat from international customers. Many of these customers view Australian wheat as the benchmark of seed coat color. The major

Asia-Pacific customers of U.S. wheat may not have an incentive to purchase Hard White wheat if they view the seed coat color as a detriment. Despite assigning the reason for darker color in 2001 to vitreous kernel content, a high percentage of which is perceived to be a benefit in milling (e.g. dark northern spring and hard amber durum), these customers may be hesitant to buy dark Hard White wheat because it may not meet their processing needs. Other international customers may have cultural considerations impacting purchase decisions: red wheat is viewed as appropriate for feeding animals while white wheat is viewed as appropriate for human food. The annual effect of environment cannot be predicted, thus making it impossible to say whether hard white from a given future harvest will be vitreous or not, whether bran coat will be light or dark, and which varieties will be more susceptible to environmental influences and genetic x environmental interactions. One way to facilitate marketing of hard white is to create subclasses which delineate a particular desirable quality factor.

Subclasses tend to highlight positive quality factors. In the case of Hard Red Spring and Durum wheat, subclasses based on vitreous kernel content convey quality factors which are considered indicative of improved *performance*, *vis-à-vis* milling yield, and premiums are often paid to sellers for these improved performance factors. To delineate the desirable nature of Hard White wheat including both lighter and darker kernels, the subclass approach could be used for Hard White wheat.

For Hard White wheat, the proposed subclass names are Hard White wheat and Hard Amber White wheat, for wheat meeting and exceeding (darker than) the interpretive color line, respectively. These names descriptively reflect the appearance of the kernel color in the overall sample. The naming of the subclasses maintains the convention utilized for Soft White wheat, which includes the subclass Soft White Wheat.

2. Contrasting Classes

Contrasting classes and wheat of other classes are "grade determining" factors. Contrasting classes in wheat essentially means the presence of wheat of opposite color commingled with the dominant class, thus white wheat is contrasting in red wheat and red wheat is contrasting in white wheat. A special case is Durum wheat, which is contrasting in all other market classes except Unclassed wheat, and all other classes are contrasting in Durum wheat. Wheat of other classes essentially means wheat of the same color but of different endosperm texture

or growth habit, thus soft red winter and hard red spring are both wheat of other classes in the market class Hard Red Winter wheat.

Grade limits for contrasting classes are substantially tighter than the grade limits for wheat of other classes (2.0 percent vs. 5.0 percent, respectively, at U.S. #2). The tighter grade limit for contrasting classes is due to the perception that quality is compromised by the appearance of a contrasting class and the potential effect on flour color and end product color. In the case of durum wheat, the reasons are the difference in milling behavior of durum, the color of flour from durum and the need to make primarily semolina from Durum wheat.

Commingling of hard white and hard red wheat is problematic depending on which class is dominant. The presence of red wheat in white wheat may degrade the visual appearance of the lot and may raise quality concerns. Since Hard White wheat is a relatively new class, it is important to keep its quality as high as possible in order to expand its marketability, both domestically and internationally.

While flour functionality is not compromised, flour color and enzymatic browning problems may result when these classes are commingled. For some domestic millers, and most millers overseas, flour color is more critical than flour ash. For example, millers selling flour for Asian noodle manufacturing would be highly critical of the presence of red wheat in white wheat, as final product color would be jeopardized. These millers typically grind Australian wheat, which has only white seed coats. While this currently applies primarily to non-U.S. millers, noodles are growing in popularity globally and will likely become an opportunity for U.S. millers in the future.

In the second case, red wheat contains the enzyme polyphenol oxidase (PPO) which when activated, causes the color of a raw noodle to become darker—a serious defect in noodle making. White wheat has much lower PPO than red wheat, therefore causes negligible color change in raw noodles. Minimizing the amount of red wheat in white wheat cargoes is one way to improve the performance of Hard White wheat.

The presence of white wheat in red wheat is perceived by most as different from the presence of red wheat in white wheat. It is useful to examine the situation for classing wheat, especially contrasting classes in hard red. The current practice is to select only distinct white and lightly colored kernels as contrasting. Darker kernels are left in