

# Effects of Drying of Wet Wheat on Milling and Baking Quality

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The problem of drying wheat is of marked general interest, since at present much of the grain in the northern portion of North Dakota is high in moisture content—too high for storage and for successful milling unless the grain is dried to a suitable moisture level. Spoilage and heating accompanied by the production of “sick” wheat generally occur in wet grain. The onset of spoilage is related to the temperature and, of course, the moisture content of the wheat, and is accompanied by a decrease in germination and rise in fat acidity.

It is known that moisture is rapidly transferred from damp to dry wheat kernels when they are mixed. In an experiment reported by the U. S. Department of Agriculture a lot of wheat at 9.7% moisture was mixed with another lot at 15.1% moisture. Three days later the mixture was transferred to another bin, at which time the originally low moisture grain was found to contain 12.2% moisture, while the high moisture wheat now contained 12.9%. Four days later the grain was again transferred, and now the moisture contents were 12.0% for the original low moisture wheat and 12.5% for the higher. Thus, the initial difference of 5.4% was reduced three days after mixing to 0.7%, and seven days after the first mixing to 0.5% moisture. This experiment shows that mixing damp and dry wheat will reduce the moisture content of the damp grain.

An early worker found that wheat of 16.3% moisture could be dried to 12.9% in one hour at approximately 140° F. without damage to the milling and baking quality. Temperature range of the wheat during drying was from 110° to 132° F. with an average of 125°. Early work done in Canada indicated that drying for two hours at 149° F. did not affect baking quality. However, the safe limit for drying temperature was found to depend upon the moisture content of the grain before drying.

The Associate Committee on Grain Research of the National Research Council in Canada has reported the results of an extensive study of heat drying of wheat. Four cereal chemistry laboratories collaborated in this experiment, and the conclusions represent the average of four independent tests. Commercial driers as well as an experimental dryer in which drying conditions could be varied at will were used. Air temperature, rate of air flow, and rate of movement of air through the grain could be accurately controlled and measured in the experimental dryer.

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No differences in flour yield were found between the heat dried samples and carefully air dried controls, but the flour ash content was higher for the former. Damage to baking quality occurred at air temperatures above 180° F. during drying, when drying very damp wheat, and when drying to a very low moisture content. In relatively few cases did drying improve baking quality. Results obtained from the experimental dryer showed that above 180° F. injury was roughly proportional to temperature rise. Under carefully controlled conditions, wheat above 18% in moisture content could be safely dried. A close relation was found between maximum temperature of the hot grain and the final moisture content. This emphasizes the point that over-drying involves grave risk of raising the wheat temperature to a level that may cause injury, even though the temperature of the drying air does not exceed 180° F.

Other experiments made in Minneapolis have shown that neither direct drying, in which hot flue gases from the burning fuel are drawn from the furnace and, mixed with air, are passed through the grain, nor indirect drying, by air heated from passing over steam coils, had appreciable effects on the milling and baking quality of 16.0% moisture wheat. The wheat was dried to an average moisture content of 13.0%. No absorption of sulfur dioxide by the wheat was noticeable when coke containing 0.56% sulfur was employed for fuel.

In conclusion, there is little danger of damaging the milling and baking quality of wheat by drying providing the temperature of the heated air is kept below 180° F., and the moisture content of the dried wheat is not too low. Apparently wheat containing 18.0% or even more of moisture may be safely dried. No investigations on the effects of drying on the macaroni-making quality of durum wheat have been reported, but presumably the conditions should be the same as for bread wheat.

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### "GELSOY"

Keeping up with the new products of the four USDA Regional Research Laboratories involves learning a new word now and then. The latest is "Gelsoy." This is a soybean-protein product from the Northern Laboratory at Peoria, Ill., that may find at least three different uses. As the first vegetable protein material known to jell, it can be used as a jelling agent in various food products, can be whipped like egg white to make fluffy and nutritious meringues for pies and cakes, or can serve as a versatile adhesive. Although it is not yet on the market, laboratory tests have demonstrated its potential usefulness.

Gelsoy is a fine white powder obtained from soybean flakes by a process of alcohol and water extraction. It has the bland taste desirable for food uses and mixes easily with water for whipping and jelling. Marshmallows and other candies, puddings, ice creams, soups, and cake fillings are some of the food products in which Gelsoy may find a place.—USDA Agricultural Research Administration.