

2.9: Rye Flour

Rye is a hardy cereal grass cultivated for its grain. Its use by humans can be traced back over 2,000 years. Once a staple food in Scandinavia and Eastern Europe, rye declined in popularity as wheat became more available through world trade. A crop well suited to northern climates, rye is grown on the Canadian Prairies and in the northern states such as the Dakotas and Wisconsin.

Rye flour is the only flour other than wheat that can be used without blending (with wheat flour) to make yeast-raised breads. Nutritionally, it is a grain comparable in value to wheat. In some cases, for example, its lysine content (an amino acid), is even biologically superior.

The brown grain is cleaned, tempered, and milled much like wheat grain. One difference is that the rye endosperm is soft and breaks down into flour much quicker than wheat. As a result, it does not yield semolina, so purifiers are seldom used. The bran is separated from the flour by the break roller, and the flour is further rolled and sifted while being graded into chop, meal, light flour, medium flour, and dark flour:

- Chop: This is the miller's name for the coarse stock after grinding in a break roller mill.
- Meal: Like chop, meal is made of 100% extraction obtained by grinding the entire rye kernel.
- Light rye flour: This is obtained from the centre of the rye kernel and is low in protein and high in starch content. It can be compared to white bread flour and is used to make light rye breads. Medium rye flour: This is straight flour and consists of all the kernels after the bran and shorts have been removed. It is light grey in colour, has an ash content of 1%, and is used for a variety of sourdough breads.
- Dark rye flour: This is comparable to first clear wheat flour. It has an ash content of 2% and a protein content of 16%. It is used primarily for heavier types of rye bread.

The lighter rye flours are generally bleached, usually with a chlorine treatment. The purpose of bleaching is to lighten the colour, since there is no improvement on the gluten capability of the flour.

Extraction of Rye Flour

The grade of extraction of rye flour is of great importance to the yield of the dough and the creation of a particular flavour in the baked bread. Table 1 shows the percentage of the dry substances of rye flour by grade of extraction.



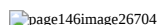


Table 1 Table of extraction for rye flour



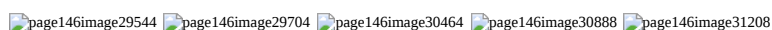
Substance

Grade of Extraction



70%

85%



Ash

0.8%

1.4%



Fat

1.2%

1.7%



Protein

8.1%

9.6%

Sugar

6.5%

7.5%

Starch	72.5%	65.1%
Crude fibre	0.5%	1.3%
Pentosans	5.2%	7.6%
Undefinable	5.2%	5.8%

Note that ash, fibre, and **pentosans** are higher in the 85% extraction rate flour, and starch is lower. Pentosans are gummy carbohydrates that tend to swell when moistened and, in baking, help to give the rye loaf its cohesiveness and structure. The pentosan level in rye flour is greater than that of wheat flour and is of more significance for successful rye bread baking.

Rye flours differ from wheat flours in the type of gluten that they contain. Although some dark rye flours can have a gluten content as high as 16%, this is only gliadin. The glutenin, which forms the elasticity in dough is absent, and therefore doughs made only with rye flour will not hold the gas produced by the yeast during fermentation. This results in a small and compact loaf of bread.

Starch and pentosans are far more important to the quality of the dough yield than gluten. Starch is the chief component of the flour responsible for the structure of the loaf. Its bread-making ability hinges on the age of the flour and the acidity. While rye flour does not have to be aged as much as wheat flour, it has both a “best after” and a “best before” date. Three weeks after milling is considered to be good.

When the rye flour is freshly milled, the starch gelatinizes (sets) quickly at a temperature at which amylases are still very active. As a result, bread made from fresh flour may be sticky and very moist. At the other extreme, as the starch gets older, it gelatinizes less readily, the enzymes cannot do their work, and the loaf may split and crack. A certain amount of starch breakdown must occur for the dough to be able to swell.

The moisture content of rye flour should be between 13% and 14%. The less water in the flour, the better its storage ability. Rye should be stored under similar conditions to wheat flour.

Differences between Rye and Wheat

Here is a short list of the differences between rye and wheat:

- Rye is more easily pulverized.
- Rye does not yield semolina.
- Gluten content in rye is not a significant dough-making factor.
- Starch is more important for bread making in rye flour than in wheat flour.
- The pentosan level in rye flour is higher and more important for bread making.
- Rye flour has greater water binding capability than wheat flour, due to its starch and pentosan content.

In summary, both wheat and rye have a long history in providing the “staff of life.” They are both highly nutritious. North American mills have state-of-the-art technology that compensates for crop differences, thus ensuring that the baker has a reliable and predictable raw material. Flour comes in a great variety of types, specially formulated so that the baker can choose according to product and customer taste.

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