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English Muffin

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INTRODUCTION

The English muffin, a unique and delightful bakery food, continues to increase in popularity with sales reaching $717 million in 2020 Table 1[1], with continued growth. This growth is attributed to increased consumption in the home and its acceptance in fast food establishments.

BREAD	Dollar Sales	Dollar Sales % Change Year Ago	Dollar Share	Unit Sales	Unit Sales % Change Year Ago
CATEGORY - ENGLISH MUFFINS	**$717,408,470**	**2.0%**		**267,723,544**	**0.6%**
ENGLISH MUFFINS	**$717,408,470**	**2.0%**	**100.00**	**267,723,544**	**0.6%**
GRUPO BIMBO-ENGLISH MUFFINS	$571,572,971	-0.5%	79.67	201,171,673	-0.9%
PRIVATE LABEL-ENGLISH MUFFINS	$65,562,504	5.1%	9.14	40,256,327	2.0%
FLOWERS FOODS LLC-ENGLISH MUFFINS	$19,189,470	110.9%	2.67	4,792,714	50.6%
UNTD STATES BAKERY-ENGLISH MUFFINS	$16,831,987	13.7%	2.35	7,433,813	14.6%
FOOD FOR LIFE BAKING CO INC-ENGLISH MUFFINS	$15,924,460	12.2%	2.22	2,800,456	12.5%
VERMONT BREAD CO-ENGLISH MUFFINS	$7,645,285	6.1%	1.07	3,053,470	14.3%
AUNT MILLIES BAKERIES INC-ENGLISH MUFFINS	$4,034,265	-8.6%	0.56	1,837,532	-20.9%
GOLD MEDAL BAKERY INC-ENGLISH MUFFINS	$2,615,983	-3.1%	0.36	882,514	-1.7%
PAN O GOLD BAKING CO-ENGLISH MUFFINS	$2,174,507	14.1%	0.30	744,827	10.0%
LEWIS BAKERIES INC-ENGLISH MUFFINS	$1,750,872	-1.3%	0.24	979,375	4.0%

Source: IRI, Chicago, Total U.S. Multi-Outlet w/ C-Store (Supermarkets, Drugstores, Mass Market Retailers, Gas/C-Stores, Military Commissaries and Select Club & Dollar Retail Chains), Latest 52 Weeks Ending April 19, 2020.

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Table 1 – Overview of major English Muffin producers [1]

Although its physical characteristics vary by locality, a good general description of the English muffin is: "good eating muffins are relatively tough, chewy, and honey combed with medium to large size holes (1/8 to l/4 inch diameter). Flavor is bland and somewhat sour. Side walls are straight and light colored. The edge between the flat, dark brown top crust is gently rounded, not sharp." (2)

English muffins can be made using a sponge dough, straight dough, or brew process. Equipment has been developed to automate muffin production, and a typical system of this type now produces 400 muffins per minute [or 2,000 dozen per hour] [3]. These highly automated systems have special requirements for formulation and processing, and require strict control of processing conditions. These conditions are necessary in order to produce high-absorption dough which can be handled in highly automated equipment, yet be fluid enough to flow in the griddle cup, and develop a steam vapor leavening system at the proper time in the griddle. Short-time straight dough processes have been developed to meet these requirements and the majority of the high speed systems now utilize this process [2].

FORMULA

Ingredient type and quantity is dictated by the processing conditions necessary to produce an acceptable muffin. The English muffin dough is basically a very cold, slack dough which has a very short fermentation time, is proofed in a hot, semi-humid atmosphere, and baked on a griddle. The usage level for various ingredients is summarized in Table 2[2].

ENGLISH MUFFIN FORMULA

Ingredient	% (Flour Basis)
Basic	
Flour	100.0
Water	83.0 to 87.0
Vital Wheat Gluten	0.0 to 2.0
Yeast	5.0 to 8.0
Sugar	0.0 to 2.0
Salt	1.0 to 1.5
Shortening	0.0 to 1.0
Calcium Propionate	0.5 to 0.7

Table 2 – English Muffin Formula [2]

Flour and Vital Wheat Gluten

The flour should be a high protein spring wheat or spring/winter patent or straight grade, having a protein content of 12% to 13%. This level of protein strength is needed to carry the high level of water and to produce a gluten network which retains the fermentation gasses during leavening in the proof box and in the griddle.

Also, the higher protein is essential for the characteristic chewy texture of the muffin.

Vital wheat gluten, the concentrated protein extracted from wheat flour, may be used to supplement and strengthen the natural flour protein. The function of the vital wheat gluten is the same as the

weight basis is the usual level of usage. As a guideline, each 1% gluten increases the protein content of the flour/gluten blend by about 0.6%.

Water:

Water, or specifically free water, in the dough is the key to leavening in the griddle. It is the free water which is most easily vaporized into steam and produces the open, porous structure or “blow holes”. The recommended range of water is much higher than for bread doughs, 83% to 87% (flour weight basis) being common. In order to incorporate this amount of water into the dough and have a dough which can be handled in the automatic divider and rounder, the dough must be very cold (68” to 69°F.) when discharged from the mixer. A variation of 3 to 4 degrees F is critical. If the dough is too warm, it will be “sticky”, and will not process through the divider and rounder satisfactorily. Also, the dough becomes very soft and sticky in the proof box and will adhere to the cups, resulting in an uneven depositing of the dough pieces in the griddle cups [2].

Ice water and ample mixer refrigeration are essential for production of cold doughs. Ice water may be used as a dough ingredient, but ice is not recommended.

Also, if the entire amount of water is added at the beginning of the mixing cycle, complete water incorporation is difficult to attain, and mixing time becomes excessively long. The preferred method is to add the water in two stages, followed by the salt addition. If this procedure is not followed, the dough may be very soft and sticky.

Yeast:

Leavening action in English muffins is a combination of expansion of the fermentation gasses from yeast activity and from steam produced by water vaporization in the griddle.

The function of the yeast is to provide fermentation gasses during proofing and early stages of baking and to contribute flavor to the finished bakery food. The yeast fermentation gasses produce the initial expansion in the proof box and during the initial cooking stage in the griddle. Then, as the temperature of the dough rises to near the boiling point of water, the water vaporizes and expands rapidly, forming the large holes and tunnels characteristic to the product.

Because of the short fermentation time and the cold dough, a high level of yeast is used, normal levels being 5% to 8% [2].

Sugar:

Since the English muffin is not considered a sweet product, sugar, in the form of sucrose, dextrose, corn syrup, or high fructose corn syrup is low, 0% to 2%. The upper level provides fermentable carbohydrates for the yeast fermentation, and a small amount of residual sugar contributes to browning of the crust.

Salt:

The English muffin has a bland flavor, and salt does not contribute materially to this flavor. A low salt level (1% to 1.5%) produces a minimum toughening effect on the gluten, and this weaker cell structure contributes to improved porosity.

Shortening:

Excessive shortening contributes to dough lubricity, decreased porosity, and to greater crumb tenderness, all undesirable characteristics in English muffins. Many formulas contain no shortening, and maximum usage is 1% to 1.5%.

Enrobing (Coating) Materials:

The enrobing of the muffin dough piece is one of the most important factors controlling English muffin quality. The type of coating and amount applied is very critical for successful processing and for product appearance.

In an automated system, the dough piece is dusted at three locations: immediately following the rounding of the dough piece, in the proofing cup, and as the dough piece is being deposited in the griddle.

The dusting material must flow freely in the dispenser, coat the dough piece efficiently, and produce a minimum of dusting into the catch pan or in the griddle. Although several materials, such as wheat flour, wheat farina, yellow corn meal, yellow corn flour, and rice flour are used, corn meal and corn flour are the primary dusting compounds. Both corn meal and corn flour, when used individually, provide benefits, but also have some deficiencies.

Corn Flour - corn flour has superior enrobing properties, clinging to the dough piece for better coverage and less loss from dusting off. However, corn flour does not flow evenly, tends to pack in the dispenser, and does not flow evenly on the “zig-zag” incline between the rounder and proofing conveyor.

Corn Meal - corn meal has excellent flow properties and contributes a “bright” appearance and crisp bite to the crust. It has less clinging properties, requires higher usage, and more is lost in dusting off. Because of its lack of adherence, more corn meal is lost in the griddle cups where it functions as a natural insulator, requiring high bake temperatures. Also, some of the corn meal may accumulate under the griddle burners and could eventually present a fire hazard if not removed routinely. A very satisfactory coating is a blend of corn flour and corn meal in a ratio of 2 to 3 parts corn flour to 1 part corn meal. Typical dusting usage of this blend is about 3% dusting compound, dough weight basis [2].

Mold Inhibitors:

English muffins have higher moisture content than bread and are expected to have a shelf life of 8 to 15 days. These conditions are conducive to mold growth and necessitate the use of high levels of mold inhibitors, the major one being calcium propionate. Normal usage level is 0.5% to 0.7%, which is sufficient to prevent mold growth during normal muffin shelf life. In addition to reducing possibilities for mold, the calcium propionate contributes to the “tart” flavor typical for most English muffins. The mold inhibitor in the dough is sometimes supplemented with calcium propionate (2% to 3%) blended with the dusting compound to provide external protection from mold. This procedure is very effective in controlling external mold development.

PROCESSING

Typical processing conditions are summarized in Table 3[2].

1. Place all ingredients except salt and 10% of water in mixer (total absorption 85%; 75% first addition).
2. Mix 30 seconds low speed, then on high speed until dough cleans from back of mixer.
3. Add remaining water (10%).
4. Mix 15 seconds low speed, 2 minutes high speed.
5. Add salt.
6. Mix 15 seconds low speed, then on high speed until properly developed.
7. Dough temperature, 68°F.
8. Rest dough for 10 to 15 minutes.
9. Scale 2¼ to 2½ ounces per dough piece, round, dust, and convey to proofer.
10. Proof 28 to 31 minutes at 115° to 125°F. and 50° to 55% relative humidity.
11. Deposit dough piece in griddle, bake 2½ minutes in preheat zone, 4 minutes in cup with lid, invert dough piece and bake 3 minutes without cup or lid.
12. Cool 30 to 45 minutes.
13. Slice or split and package.

Table 3 – English Muffin Process [2]

Mixing:

Dough mixing can be accomplished in a variety of mixers, but the most commonly used equipment for English muffin production is the horizontal type bread dough mixer [Figure 1]. Mixer size and capacity are determined by production rate of the other equipment; the size should be limited to an amount of dough which can be processed within a 20 minute period. Excessive processing time produces sticky and "gassy" doughs which are difficult to divide uniformly, and which will adhere to the rounder bars, causing production delays. English muffin doughs are overmixed, compared to bread doughs, in order to improve flowability in the griddle cup and porosity of the finished muffin. The extremely long mixing time required for the high absorption dough (17 to 22 minutes) can be shortened considerably by withholding a portion of the water and all of the salt until the dough is partially mixed.

A recommended procedure is to add all of the ingredients except the salt and 10% of the water, and mix the dough until it has cleaned from the back of the mixer (cleanup). Next, add the remaining water and mix an additional two minutes, then add the salt and complete the mixing cycle.

This procedure shortens the total mixing time by several minutes and produces a more completely hydrated dough.

As mentioned previously, the dough temperature at this point should not exceed 68 "F.

Figure 1 – dough exiting mixer - New Horizon [4]

Fermentation:

Fermentation time should be short, 10 to 15 minutes is typical. Excessive fermentation time produces a temperature build-up in the dough, resulting in a sticky dough which is difficult to process. Also, the fermentation produces excessive gas, resulting in a dough which is difficult to divide uniformly in the high speed divider.

Dividing and Rounding:

Dividing of the dough pieces can be accomplished with standard roll dividers. However, a divider in good operating condition is a must for cutting and dropping this high absorption dough. Normal scaling weight is 2-1/4 to 2-1/2 ounces per dough piece. Figure 2 is an overview of the dough hopper [near], followed by divider and rounder, leading to the dough basket conveyor lifting the dough balls to the overhead proofer.

Figure 2 – dough divider, rounder dusting [not seen], and carrier taking muffin baskets up to the overhead proofer [front to back of photo [4]

The rounding of the dough piece is equally as critical as the mixing procedure, and the degree of rounding affects the quality of the muffin. Too much rounding, or making a compact dough piece, will produce a product having good volume, but little or no porosity. A light rounding pressure will produce a muffin having excellent porosity, but lacking in volume and having poor symmetry. Therefore, the rounding bar should be adjusted to produce a round, firm dough piece, but not so tight that the dough will stick to the bar and cause production delays.

Figure 3 – end of molder and before zigzag board with dusting [6]

At this point, the first dusting is applied to the entire dough piece as it rolls down a zig-zag chute to the conveyor which transports the piece to the proofer. Dusting at this point should completely cover the piece but not be excessive. Insufficient dusting will cause sticking problems in the proofer, while excessive dusting will result in some of the dusting materials dropping into the griddle, causing problems at that point. The amount of dusting is controlled by the feed from the dispenser and by the slope of the zig-zag conveyor Figure 4.

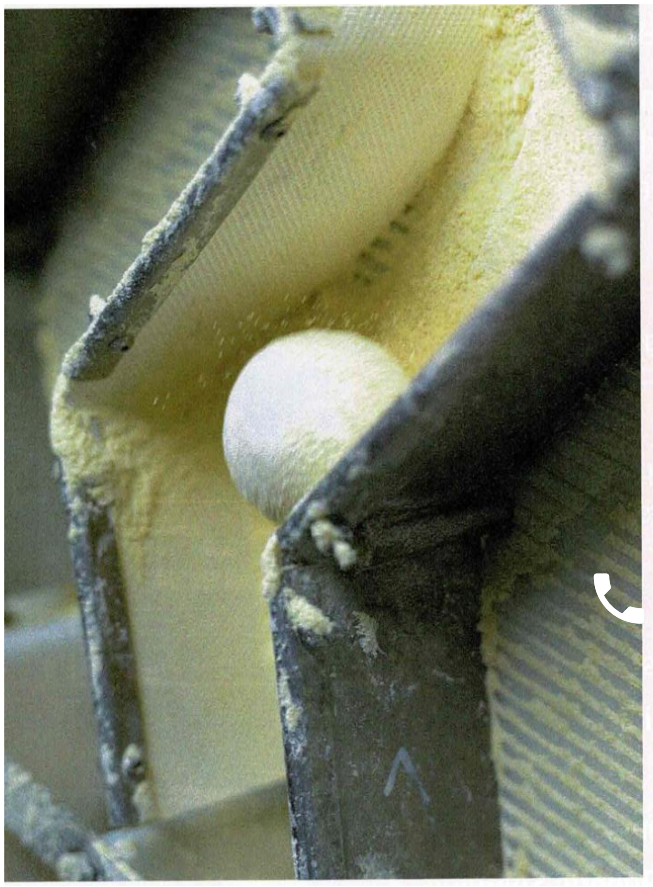

Figure 4 – zigzag board with dough ball from moulder to proofing basket [3]

Proofing:

Most automatic proofing systems are standardized on a 28 to 31 minute proofing time. The individual dough pieces are dropped into cups which are usually canvas covered. A small amount of dusting flour is dusted into the cups prior to the depositing of the dough piece Figure 5.

Figure 5 – dough balls at end of zigzag board in staging cup to be placed into the mesh basket for proofing. [3]

The proof box is maintained at a temperature of 115 o to 125 “F. and a 50% to 55% relative humidity, a relatively dry proof box. At the end of the proof time, the muffin piece should feel slightly dry to the

touch but should not have a dry skin formed on the surface. The dough piece should be fairly flat and of sufficient diameter to nearly fill the griddle cup when deposited. If the dough piece is too small or crusted, it will not expand properly and the muffin will be small and lack symmetry. If the dough piece is too large, it will have excessive rise in the cup and have good symmetry but poor porosity.

Depositing and Baking:

After proofing, the dough pieces are deposited in griddle cups on a rotating cylinder heated by gas burners. The dough pieces are deposited in the griddle cups by means of a 360-degree turning mechanism. This turning mechanism keeps the top of the proofed dough piece - on the top - as it's placed in the griddle. Although the size of the cups may vary, the most common dimension is 3-7/8 inch diameter and 1 inch depth [2].

At this point, the cups are open at the top and the griddle plates have not reached full baking temperature. After approximately 2-1/2 minutes travel time, during which the dough piece flows to fill the cup, the griddle cups are topped with metal covers. Final symmetry of the muffin is largely determined at this point by the height and condition of the cup lid or top flight plate.

Satisfactory muffins are usually produced with about 1-1/4 inch space between the top of the cup and this top flight plate [Figure 6]. The top flight plates must be checked regularly to be certain the height is uniform across the griddle band, and that the plates have not become warped through mishandling. For example, accidentally stepping on the plates while maintaining the equipment or accidentally spraying the hot plates with water can cause serious warping problems. The result will be nonsymmetrical English muffins [2].

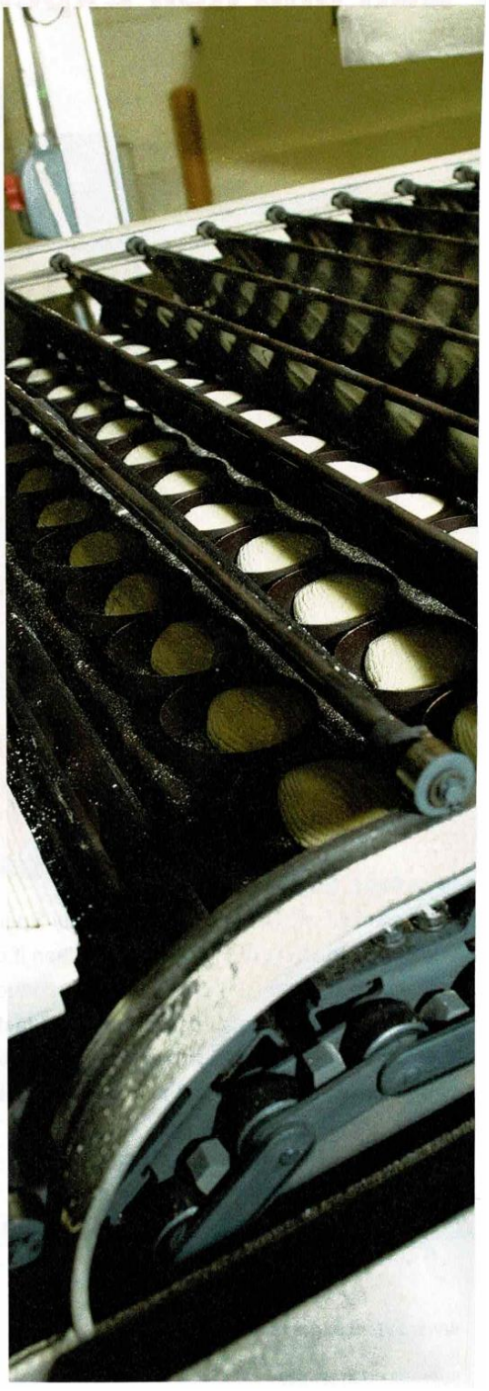

Figure 6 – griddle cups with proofed dough [3]

After a four minute bake, the muffins are automatically emptied from the griddle cups and inverted 180 degrees for a final 3-1/2 minute bake on flat griddle plates without rings or lids. Another style of griddle is a double plate, single conveyor type. In this system, the dough piece is deposited by rotating it 180 degrees, and depositing the piece, wet side down, in the griddle cup. Each row of cups has its own plate

which fits on the top for an initial four minute bake. The cups are then inverted and the top plate becomes the griddle for the final 3 to 4 minute bake [2].

The baked muffins are automatically deposited on a conveyor and cooled 30 to 45 minutes, preferably in a filtered air atmosphere to reduce the possibility of surface mold contamination [Figure 7 and 8]. The internal muffin temperature should be about 5°F above the ambient temperature for best slicing or splitting.

Figure 7 – Exiting oven and entering the cooling tower [5]

Figure 8 – muffin cooling conveyor [5]

Slicing or Splitting:

Muffins are generally either sliced or “split” before packaging, the process being determined by consumer preference. The original English muffins were usually split by inserting a fork at several points around the circumference of the muffin, then pulling the muffin apart. This procedure produced an irregular and rough surface, having about twice as much surface area as the surface of a sliced muffin [Figure 9].

Figure 9 –Interior of split English muffin [6]

This split muffin exposes a rough surface to the toaster. The flavor of the toasted muffin is enhanced by the variation in degree of toasting in this rough surface and the rough surface also allows the heat to penetrate further into the muffin, improving the chewiness of the product [2].

This splitting operation is accomplished in the bakery by one of several types of splitters, producing muffins which may be pulled apart by the consumer, then toasted or broiled.

Slicing of muffins is accomplished by special muffin slicing equipment which produces a smooth surface of the hamburger bun slice.

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