Layers of Flavors

The keys to success in producing artisan confections with multiple centers are in understanding the compatibility of centers and inclusions.

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Producing confections using multiple layers of centers presents an opportunity for the artisan confectioner to create unique products and an expanded product line, often while using formulas that are already in an existing repertoire. The keys to success are in understanding the compatibility of centers and inclusions with regard to moisture and fat migration, and the processing techniques that are required for the various centers.

ADVANTAGES OF LAYERING CENTERS

By combining multiple centers within one piece, the potential flavor profiles are expanded and the flavor complexity is enhanced. Flavors may be classic combinations like an American PB&J, a European black forest or tiramisu, or flavors evoking other cultures such as Latin American dulce de leche or Asian sesame. Flavor combinations may also be more avant-garde, modern and unexpected in a confection, like yuzu and black sesame, bacon and maple, or sundried tomato and olive oil. Whatever the goal, exponentially more complex flavor profiles can be expressed using multiple layers than can be achieved using one center alone.

In addition to achieving interesting flavor combinations, layering centers also permits greatly heightened textural variations within a piece. The possibilities for textural contrast are myriad, such as a crispy nutty layer combined with a marshmallow or soft nougat, a chewy caramel combined with a rich, creamy ganache and nuts, or a crisp layer combined with a nearly fluid caramel center. The textural combinations are almost endless, and are limited only by one's understanding of the centers employed.

All of these wonderful flavor and textural advantages can often be achieved using formulas that are already in use in the operation, but assembling them in combinations rather than individually. This technique creates an opportunity for a greatly expanded product line of unique, signature items using existing formulas.

The technique of layering centers can be applied to either individual pieces or to artisan chocolate bars. Many manufacturers do a brilliant job with layered chocolate bars, but there is no reason artisans should not create their own bars. In doing so, artisans might do well to avoid mimicking the popular mass-produced bars on the market, but might better focus on making unique, niche bars that manufacturers would not produce ➤

because of their more narrowly focused market appeal, or could not produce due to limited shelf life or higher cost.

CHALLENGES OF LAYERING CENTERS

There are definite challenges accompanying the advantages of layered confections that must be overcome to be successful. These challenges relate both to production techniques and to shelf life of the finished product. The production issues are the assembly technique and the logistics of assembly, while the shelf-life concern is primarily migration of fats and water within a layered confection.

Moisture Migration

The first and arguably the most important challenge to understand when combining centers is moisture migration. Moisture migration occurs when the free water from a center with higher water activity migrates into a center with lower water activity. Over time, the water activity (A_w) in each of the centers will equalize, changing the characteristics of both. In the example in Figure 1, moisture from the ganache migrates into the lower-A_w caramel, destroying the quality of each.

Moisture migration causes loss of textural contrast between layers; crisp centers or inclusions can become soggy, and soft centers or inclusions can become firmer. Moisture migrating into a noncrystalline center such as a caramel or toffee causes crystallization of the sugar, again resulting in totally altered mouthfeel and flavor from that which the centers originally had. Moisture migration is the fastest way to a diminished shelf life in layered confections, and will very quickly result in a loss of quality of both centers and inclusions if it is not controlled.

There are several ways to avoid damage from moisture migration when using multiple layers within a single piece. Using centers with a very similar A_w will prevent moisture migration and is a very practical solution. As an example, two layers of different flavors of ganache combined will not suffer from moisture migration. Centers with similar A_w, however, are likely to have little if any textural contrast between them, and so the opportunity for interesting textures is diminished. Using centers, such as fat systems, that are not affected by moisture migration is another way to avoid the problem. Fat systems such as gianduja are virtually unaffected by moisture migration, but using only fat systems as centers severely limits variety. The other technique to mitigate moisture migration is to create moisture-resistant barriers between components with disparate water activity. Any non-water-soluble material such as fat, wax and shellac is an effective barrier to moisture migration, and commercial products for this use are available. The simplest solution for most artisans is to apply a layer of fat such as cocoa butter between layers with disparate A_w to prevent the movement of water and the subsequent loss of quality within the confection.

Fat Migration

Like moisture migration, fat migration within a layered piece can also lead to diminished quality. Fat migration occurs when fat of a lower solid fat content, such

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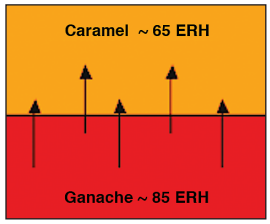
Moisture Migration



Moisture moves from the higher-ERH center into the lower-ERH center until equilibrium is reached. Result: dry ganache and crystallized caramel.

Figure 1

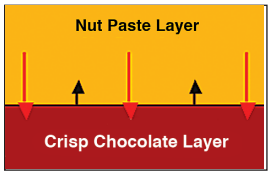
Matching the proper assembly technique to the centers is another key to success. Creating slabs of the layers, then cooling, cutting and enrobing is the most commonly employed method of assembly.

as nut oil, migrates into fat of a higher solid fat content, such as cocoa butter. Ultimately, the fats blend until their solid fat content becomes equal. In Figure 2, the oil from a nut paste layer migrates into a chocolate layer.

If left unchecked, fat migration also has deleterious effects on layered confections. Fat migration causes chocolate to bloom prematurely, in as little as a couple of weeks with some nut paste centers. Fat bloom, while harmless, makes products unsalable, and so fat migration can very quickly destroy products. Bloom is not the only malady brought on by fat migration though; as fats migrate and equalize, textural contrast is lost. For instance, in a peanut butter center enrobed in chocolate, the chocolate will soften and the peanut butter filling will become more firm, until eventually all textural contrast is lost. Fat migration can also lower the melting point of chocolate, resulting in easily damaged pieces. This is a particular concern with lauric fats such as coconut oil, which have a pronounced eutectic effect on cocoa butter, resulting in a greatly lowered melting point of the chocolate. As fats migrate and equalize, the flavors within the components also blend, resulting in a more uniform, less distinct and less interesting flavor experience for our consumers.

Like moisture migration, fat migration can be avoided by using centers with very similar fats within a piece. Again, though, they are unlikely to have the desirable textural contrast of dissimilar fats. There are times that incompatible fats, such as oil in nuts or lauric fats, when used with chocolate, provide flavor or textural effects that give the products unique characteristics, and therefore are vital to the success of the piece. Barriers to fat migration are an effective method to prevent loss of quality between incompatible fat components. A barrier to fat migration must be an aqueous solution such as gum arabic, starch or pectin. Again, several manufacturers make products that are well suited to this sort of application.

Fat Migration



Oil (low SFC) from the nuts moves into the chocolate. Cocoa butter from the chocolate moves into the nut paste center.

Result: softened chocolate and loss of textural contrast.

Figure 2

Assembly Techniques

Matching the proper assembly technique to the centers is another key to success when making layered confections. Creating slabs of the layers, then cooling, cutting and enrobing is the most commonly employed method of assembly. Centers that are deposited hot, such as soft caramels or jellies, must be assembled by slabbing. Centers with good stand-up quality, that won't flow and will hold their shape, such as ganache and butter ganache, are well suited to slabbing technique. The alternative to slabbing centers is to shell mould them. Shell-moulded centers must be deposited at much cooler temperatures, below 85°F, so as to not damage or melt the chocolate shell. An advantage of shell moulding is the use of centers that are soft and could not be cut and enrobed; soft centers provide textural contrast within a confection. Caramel filling (true caramel, not the stand-up soft caramels, or Maillards) and soft nut paste fillings are good examples of the type of centers that require shell moulding for assembly. Centers like ganache or butter ganache are also suited to this technique because they are deposited at relatively cool temperature. ➤

Processing Logistics

The order of layers within a piece greatly influences the consumer's eating experience. Order affects how the consumer experiences the flavors: which one comes first, which one lingers and how they meld together. Mouthfeel is even more greatly affected by the order of the layers within a piece. When there is a very firm or crisp layer, it generally makes sense to put it at the bottom of the piece. In addition to flavor and texture, the order of layers also affects the appearance of the cross section of the piece. All of these sensory considerations should go into planning how the finished product will be composed.

The order of assembly is not necessarily identical to the finished arrangement, but is determined by the requirements of each center. For instance, when layers that are not heat tolerant are combined with centers that are deposited hot, the heat-sensitive layer must be deposited last, regardless of the arrangement in the finished piece. It is quite common practice to build layered confections out of sequence or upside down in order to work with each of the centers properly.

THE CENTERS AND THEIR CHARACTERISTICS

What follows is a brief summary of many various confectionery centers and their characteristics with regards to making layered confections.

Ganache is the quintessential artisan confectionery center. Its high A_w of about .80 to .85 gives it a short shelf life, which, along with its cost, makes it generally unfeasible for large manufacturers to use. Consumers love ganache, though, and it is a staple of many artisan confections. Ganache is subject to moisture migration, and due to its high A_w will nearly always lose water to surrounding centers or to inclusions. Ganache cannot tolerate heat when deposited, and so when used in conjunction with centers that are deposited hot, the ganache must be the last layer deposited regardless of its place within the finished confection.

Butter ganache is a center that is seldom used in American confectionery, although it is well suited to artisan confections. It has a relatively high A_w of .70 to .75 and is prone to moisture migration. The high butter content also makes it prone to fat migration, and like cream ganache, butter ganache cannot tolerate heat when depositing.

Noncrystalline sugar confections include caramels, toffee, brittle and hard candy. These products all have low A_w and are all extremely hygroscopic. They will readily absorb moisture from other centers or from the atmosphere, resulting in crystallization and loss of quality. These centers must be deposited while hot, and therefore are deposited before layers that cannot tolerate heat.

Crystalline confections include fondant, fudge and crèmes. They are prone to moisture migration and have a relatively high A_w in the range of .75 to .80. They therefore have a tendency to lose moisture in a layered confection. Crystalline confections generally must be deposited while warm.

Marzipan has a relatively high A_w of .75 to .80, and so has a tendency to lose moisture in moisture migration. The oil from the nuts also causes fat migration, softening the firmer fats around the center such as cocoa butter.

Fat systems are mixtures of solids surrounded by fat, but containing no water. They include chocolate, gianduja (chocolate with nuts refined into it), nut pastes such as peanut butter and praline paste, and meltaways, typically made with a lau- ➤

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ric fat to dramatically lower the melting point. Fat systems are not subject to moisture migration, as they have no water to give up and do not absorb water in normal shelf life. In fact, fat systems are all effective barriers to moisture migration between layers. Fat migration is a concern with these centers, particularly with nut oils, which cause bloom and soften chocolate, and with meltaways made with lauric fat, which can soften chocolate, lower the melting point of cocoa butter and also result in bloom.

Jellies make a great layer in confections. They are bright in color and vivid in flavor. They have a relatively low A_w of .60 to .75 and are fairly hygroscopic, so moisture migration must be considered when using them. Most jellies are deposited while hot, so must be deposited before layers that are not heat tolerant. As an aqueous system, jellies are an effective barrier to fat migration.

Aerated confections, primarily nougat and marshmallow, are widely used and appreciated centers in layered confections, both artisan and in large production. Their A_w varies greatly depending on the total water content, whether the nougat is soft or firm, and whether it is a crystalline or noncrystalline nougat, short textured or chewy. Like other sugar confections, the noncrystalline nougats have a low A_w and are hygroscopic, while the A_w of the crystalline nougats is much higher. In either case, aerated confections are subject to moisture migration and so may either tend to lose or gain moisture within a confection. Aerated centers must generally be either warm or hot when deposited.

THE INCLUSIONS AND THEIR CHARACTERISTICS

Nuts and seeds are the most widely used and appreciated inclusions in confections of every sort. They provide not only crunchy textural contrast, but appealing flavors and healthful oils. Because nuts and seeds are resistant to moisture migration and not adversely affected by the heat of deposited centers, they can be used freely in a wide variety of centers, from ganache to toffee and everything in between. The oil in nuts and seeds, however, does migrate into more-solid fats. The more finely the inclusions are chopped or ground, and the more surface area is exposed, the more severe the fat migration will be.

Dried fruit is a wonderful inclusion in confections. It has brilliant colors and wonderful flavors. Dried fruit is prone to moisture migration and will generally absorb water due to its low water activity.

Cereals and farinaceous products Products like cereals, pretzels and crackers can add very interesting and unexpected textures and flavors to layered confections. These inclusions have an extremely low A_w and will readily absorb moisture from centers if steps are not taken to mitigate moisture migration, so they cannot be used in centers containing water without first coating them with a barrier, such as fat, to prevent damage.

Rework Using rework as an inclusion in layered confections is an opportunity to create unique textural and flavor effects. Many types of rework such as toffee, jellies, nougat and fudge can all be used in layered confections. As an inclusion, rework behaves just as the center would with regard to migration of fat and water, so when using disparate rework and centers, steps must be taken to control and maintain quality.

Figure 3 illustrates the practical applications of various centers in confections as they are likely to affect the artisan confectioner in the production and storage of composite candy bars. Susceptibility to ➤

moisture migration and fat migration, sensitivity to heat, the temperature when depositing and whether the center cuts cleanly at room temperature are all important considerations when composing layered confections and planning assembly logistics.

The following are a few examples of layered confections that I have created, and some observations on why I think they are successful.

The Salt & Pepper Bar (Figure 4) has very familiar flavors, but they are unusual when found within a confection. The bar consists of a layer of salted caramel and a layer of black pepper ganache. There is textural contrast between the chewy caramel and the creamy ganache. Applying a fat barrier between the centers will mitigate moisture migration and extend the shelf life. These bars are created in a slab, cooled, cut and enrobed. The caramel layer is deposited first when assembling because it must be deposited hot, and the ganache cannot tolerate heat.

Mint Madness (Figure 5) is made from two different meltaways: chocolate mint and white chocolate. The creamy white chocolate meltaway layer provides flavor and color contrast from the intense chocolate mint. Laminated peppermint hard candy rework provides textural contrast. It would be very difficult to use the hard candy rework in anything other than a fat system due to moisture migration and its hygroscopicity. Because it is so rich, this bar is only about a half-inch high prior to enrobing. This bar was made in slab form, but meltaways can be deposited into shell moulds as well.

The center of the Strawberry Temptress (Figure 6) has three distinct layers: a strawberry pectin jelly, a tender, crystalline white nougat and a thin, crisp layer of toasted almonds embedded in dark chocolate. In production, the nougat is deposited first, then the jelly, and, after cooling, it is flipped to add the chocolate almond layer. For cutting, enrobing and presentation, it is turned back over so the strawberry jelly layer is on

Susceptibility to moisture migration and fat migration, sensitivity to heat, the temperature when depositing and whether the center cuts cleanly at room temperature are all important considerations.

Practical Applications of Centers and Inclusions in Confections

Center	Affected by moisture migration[1]	Affected by fat migration	Sensitive to high heat	Temperature when deposited	Cuts cleanly when cold
Chocolate	N	Y	Y	Warm	
Ganache	Y	N	Y	Warm	Y
Butter Ganache	S	S	Y	Room temp	Y
Soft Caramel	Y	N	N	Hot	Y
Toffee	Y	N	N	Hot	N
Hard Candy	Y	N	N	Hot	N
Fudge	Y	S	N	Warm	Y
Fondant	Y	N	N	Warm	Y
Marzipan	S	S	N	Room temp	Y
Gianduja	N	Y	Y	Warm	Y
Meltaway	N	Y	Y	Warm	Y
Jellies	S	N	N	Hot	Y
Nougat	Y	N	N	Warm to hot[2]	Y
Inclusions					
Cereal/farinaceous	Y	N	N	Room temp	Y
Nuts	N	Y	N	Room temp	Y
Dried Fruit	Y	N	N	Room temp	Y
Confectionery rework[3]					

Y = Yes N = No S = Slightly

1 Whether a center absorbs or exudes water depends on its A_w.
2 The temperature when depositing depends on the type of nougat. Hard nougats must be hotter when deposited.
3 Confectionery rework as an inclusion has the same characteristics as when the products are used as centers.

Figure 3

By using existing formulas and combining more than one center within a confection, artisans can create great flavor and textural combinations, and compose unique signature items.

the top. This bar is also assembled in a slab, cooled, cut and enrobed.

The Bimini Bar (Figure 7) is an example of a shell-moulded layered confection featuring the tropical flavors of coconut and rum. The coconut layer is soft and doesn't have the standup that is required for slabbing, so shell moulding is the best option. The rum ganache has a very similar A_w to the coconut filling, so moisture migration is not a problem. The textural contrast in this bar is achieved not only from the two different fillings but from the crisp chocolate shell as well.

CONCLUSIONS

Layering multiple centers together in a single confection creates some real opportunities for artisans. By using existing formulas to greatly expand their product line and combining more than one center within a confection, artisans can create great flavor and textural combinations, and compose unique signature items to differentiate their business and strengthen their brand. The major obstacles to success in layered confections are moisture migration, fat migration, applying the correct assembly technique to the centers and the logistics of processing these complex confections. Understanding the obstacles, as well as the properties of the centers and inclusions, will help to ensure success in making artisan layered confections. □

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Salt & Pepper Bar

Figure 4

Mint Madness Bar

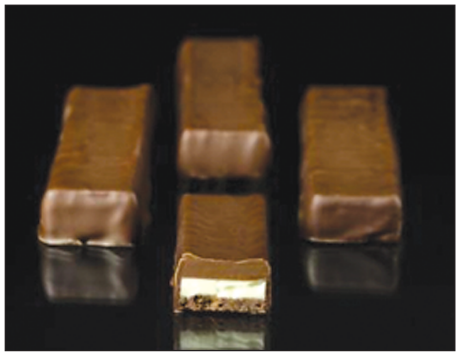

Figure 5

Strawberry Temptress Bar

Figure 6

Bimini Bar

Figure 7