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Apricot Jelly Candies Research Project
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Abstract:

Research was done to see if apricot jelly candies can maintain desirable qualities with decreasing amounts of sugar content. Sugar was substituted in different amounts such as 150 grams of puree-canned apricot for the extreme trial and 75 grams of sugar and 75 grams of puree canned apricot for the 50/50 trial. The control had the highest sugar content, which theoretically would firm up the best, weight the most, retain the most water, and have a high percent sag compared to the 50/50 and extreme apricot jellies. From objective testing and evaluations, it was concluded from the wettability test that the control weighed 71 grams, which was the most before being soaked into a container of water. It had the highest water gain due to the higher sugar content. The extreme jelly did weigh the least due to its lower level of sugar content. The 50/50 jelly had the highest percent sag, which concluded that it was the tenderest. In the evaluation testing, it was concluded the control had the most "likes" in overall acceptability and firmness. It also ranked the lowest in "likes" in sweetness and flavor; this could have been due its very sugary content and flavor. The extreme jellies were ranked with the most "likes" in appearance, flavor, and sweetness. This could have been due to the canned apricots' bright orange color that influenced the jellies to have that same bright color. The 50/50 jellies were a light orange color and the control jellies were a darker orange color. The sweetness level of the extreme jellies was more desirable because the taste was more of a fruity apricot flavor. Overall it was possible to produce an apricot jelly candy by replacing the sugar content with puree canned apricots, which would still have desirable qualities compared to the full sugar jelly candies offered from the control.

Introduction/Purpose:

This experimental food research project was conducted to produce a fruit jelly candy. Fruit jellies are typically made with a high amount of sugar to help set the jelly (Harrison & Andress, n.d.). The goal was to produce a jelly with less sugar and more fruit by substituting sugar with fruit puree. These less sugar jelly candies are aimed towards children whose diets typically require less sugar (Johnson, R. K., Appel, L. J., Brands, M., Howard, B.V., Lefevre, M., Lustig, R.H., Sacks, F., Steffen, L. M., Wylie-Rosett, J., 2009, August 24). We will use sensory evaluations to decide on the more desirable fruit jelly candy aside from the original recipe (the control). The jelly candies would be modified into two variables, one for substituting the amount of sugar to half the amount of sugar and half fruit puree (the 50/50 recipe) and the other for full fruit puree (the extreme recipe). Objective testing such as wettability and percent sag will provide evidence to which recipe will have more desirable qualities of firmness and tenderness. Our hypothesis is that the Extreme recipe will be more desirable because it has a substantial amount of sugar from the canned apricot that will improve the taste and quality of the fruit jellies compared to the control. The extreme recipe will provide a less sweet tasteful fruit jelly that is more preferred compared to the control. This experiment was conducted to prove that fruit jelly candies don't need a high sugar content to have the best overall acceptability, appearance, flavor and sweetness.

Method/Design:

Our ingredients were 325 grams of Knott's apricot preserves, 150 grams of C&H white granulated sugar or Del Monte canned apricots in light syrup, 14.3 grams of Knox gelatin, and 2 measurements of 2.6 fl oz of Simply apple juice. The flavor of the jelly uniqueness was a concern because apricot has an acquired taste that everyone isn't fond of. Apricot was chosen because of its uniqueness, sugar content, nutrition content and its texture. The product was made

with apricot preserves instead of jam due to higher sugar content to help aid in setting the jelly. Unfortunately apricots aren't in season; so canned apricots in extra light syrup were used to keep a low amount of added sugar in the product since canned fruits usually contain syrup with added sugar.

The supplies used in our experiment were a liquid measuring cup, a spoon, a strainer, a medium saucepan, five bowls, a whisk, food processor, a measuring scale and a small muffin tray. At the start of the experiment, measurements of the ingredients were 325 grams of apricot preserves, 150 grams of white granulated sugar, 14.3 grams of gelatin, and two 2.6 fl oz of apple juice (one for the gelatin and the other with the sugar and/or puree), which were all put into individual bowls. For the 50/50 and extreme recipe, the canned apricots were pureed. In the 50/50 recipe, we used 75 grams of white granulated sugar and 75 grams of the pureed canned apricot. For the extreme recipe, we used 150 grams of the pureed canned apricots.

First gelatin was sprinkled into a bowl of apple juice and was put aside for 5 minutes. The second measurement of apple juice was added along with sugar into a small medium saucepan and brought to a boil over medium high heat. It was cooked and stirred until the sugar was dissolved for about 5 minutes. Then the apricot preserves were added and whisked until combined. It was returned to a boil and cooked until it thickened up and became syrupy for about 2 minutes. The apple juice and gelatin mixture was added and whisked until the gelatin was dissolved. The finished product was strained into a measuring cup and poured into each mold of a small muffin-baking tray. Then the tray was put into the refrigerator for about a few hours to 1 ½ days.

After the apricot jellies firmed up, objective testing needed to be done to see which

recipe had desirable qualities in their jellies. A toothpick and ruler were used to make accurate measurements. Percent sag was done first, where the measurements of the jellies from the control, extreme, and 50/50 recipes were taken and recorded. The jellies' height of depth was measured in the muffin mold. Then the jellies were taken out of the mold and put on a plate to measure the height. The depth in the container measurement was subtracted with the depth of measurement on the plate and then divided by the depth in the container measurement. The estimate was multiplied by 100 to get the percent sag.

All of the jellies were taken out of each muffin mold and placed onto parchment paper. One jelly from each jelly recipe was tested on wettability. First the jellies were weighed on a measuring scale then put into a small container that contained two tablespoons of water and soaked for 5 seconds. Then each of the jellies were weighed again to measure wettability.

The last test was a panel testing where people would rate our product from the Hedonic scale of 1 being "extremely dislike" to 4 being "neither like or dislike" to 7 being "extremely like" on appearance, firmness, flavor, sweetness, and overall acceptability. This was done three times for each trial recipe and then done one last time for the final end product. For the final end product, each recipe jelly was assigned a 3-numbered code and labeled on a small black plate with all 3 recipes. 834 was the 50/50, 793 was the control, and 561 was the extreme.

Results/Discussion:

In most of the trials, the jelly weren't firming up correctly due to the incompatibility of the setting mediums and an undetermined setting time range of how long the jellies would set. The first trial was the control recipe, which was made in lab. It was put into a glass pan and allowed to set in the fridge for 2 hours and 10 minutes. Unfortunately there wasn't enough time

for the jelly to set at the recommended three hours, which was why the jelly was taken out early. The jelly candy turned out transparent, yet sticky. It was then wrapped in saran wrap and put on top of ice to be taken home. During the 1 hour transfer of the jelly into the fridge for complete setting, some water leaked onto the jelly, so it was set on a strainer in the fridge to dry for a few more hours, resulting in a rubbery texture. The only sugar available at the time to coat the jelly was pure cane sugar, being less refined than regular white granulated sugar. The jelly was only rated on acceptability for flavor due to the texture or possibly due to the accelerated set time by the ice and the type of sugar used. It was personally thought that the large sugar crystals overpowered the jelly flavor. The flavor was verbally accepted by family members.

The second trial again included the control and the extreme for sensory and objective evaluations of percent sag and wettability. Our jellies needed to have consistent sized samples for the final trial, which was a concern due to the difficulties of producing consistent sized samples from a glass pan, so silicone molds were used instead. This time the recommended three-hour set time was followed but the jellies didn't set well. According to the first trial and objective testing of this trial's jellies from small glass bowls, this suggested that more time was needed to set the jelly and to possibly use another medium for them to set in. Due to the jellies not setting, they were rated on texture, flavor, and overall eating quality, excluding appearance and consistency. For the control, the texture was rated "liked" a little more and the flavor and overall eating quality was favored. Comments included "too sweet... gooey... [and] soft." For the extreme the texture was rated "liked" the same and the flavor was favored, although a couple evaluations favored them less because they were too sweet. Overall eating quality was favored.

In the third trial the 50/50 apricot jellies were produced and evaluated with sensory and objective testing. This trial was done at home to allow it to set for about 1 ½ days. A metal

muffin tray was used to mold the jellies. Transportation was a concern because of the process of syneresis would occur when transporting the jellies to the testing site (Joseph, S., 2012, September 29). The jellies were made and left out for 30 minutes to mimic the transportation time from home to the testing site. Another concern was that the syneresis would interfere with the sugar coating. In our testing, some of the jellies were coated with sugar, which immediately soaked up the sugar within a minute. This was an attempt to see whether it would be best to produce the jelly in the lab a couple days before the trial to avoid the syneresis process on the day of the trial. The jelly had been setting in the fridge for nearly two days before another piece of jelly was coated. Within twenty minutes the jelly went from soaking in about 2/3 of the sugar to most of the sugar. The jelly started to "sweat" and along with the coated sugar, the jelly went from being sticky to becoming completely sticky and wet. This may have been due to the syneresis process of it being stored in the fridge for a longer period of time. This would lower the quality of our product, so elimination of the sugar coating was a thought, yet it was believed to invalidate the experiment due to two ingredients being altered when only one can be altered. For another reason to eliminate the sugar coating was due to our sensory evaluations, which stated that the jellies were "too sweet... sugary," and disliked overall 3 out of the 11 test scorecards of the control and extreme product had indicated the jelly was also too sweet. For those reasons, this lead to a decision in eliminating the sugar coating, which was approved (S. Joseph, electronic communication, 12/06/12).

With all the data, the final product was tailored to its best advantage due to trial objective testing and sensory evaluations. We concluded that the jellies set well in the metal muffin tray compared to the silicone and glass baking mediums. The jellies would set best in a time frame of about 1 ½ days to avoid syneresis. The sugar coating of the jellies needed to be eliminated due to

poor quality purposes, sweaty and sticky. Also in the objective testing, we found that the extreme jelly weighed less than the control and the 50/50 jellies. The control jelly soaked up 1g of water more than both the 50/50 and the extreme jellies during the wettability test. In the percent sag test, the extreme and the control jellies had the same percent sag of 7.6%, yet in the 50/50 recipe, the jelly had higher percent sag of 23%. With these changes, the final product was ready to be produced and evaluated on finding the most desirable fruit jelly.

On the day of the final evaluation, the fruit jellies were gone relatively fast and 25 evaluations were filled out quickly. From tallying up the most “Likes” in the evaluation scorecards, it was concluded that panelist preferred 561, the extreme jellies in appearance, flavor and sweetness. The panelist also ranked 793, the control to have the most “Likes” in firmness and overall acceptability. The 834, 50/50 jellies had the least “Likes” in appearance, firmness, and flavor. The control had the least “Likes” in sweetness and flavor. 561, the extreme had the least likes in overall acceptability. Due to scorecards, the major of the panelist liked all the jellies than disliked.

Table 1:

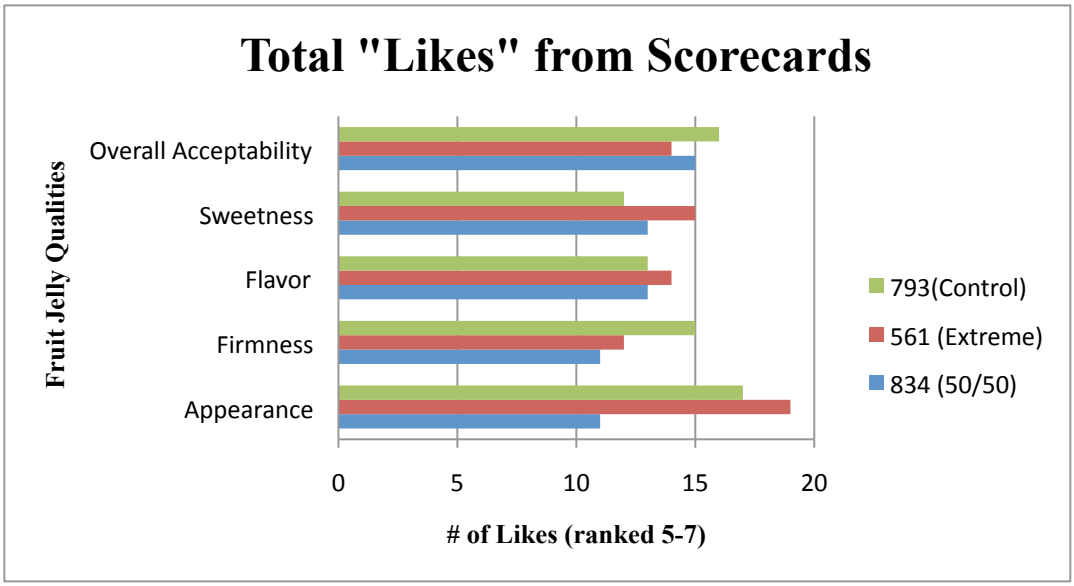
Total "Likes" from Final Scorecards

	834 (50/50)	**561 (Extreme)**	**793(Control)**	**“Likes”**	**Least “Likes”**
Appearance	11	19	17	561	834
Firmness	11	12	15	793	834
Flavor	13	14	13	561	834, 793
Sweetness	13	15	12	561	793
Overall	15	14	16	793	561

Acceptability

This table shows that the Extreme recipe had the most "Likes" compared to the Control and 50/50 recipes.

Graph 1:



This graph shows that all the recipes had similar amounts of "likes."

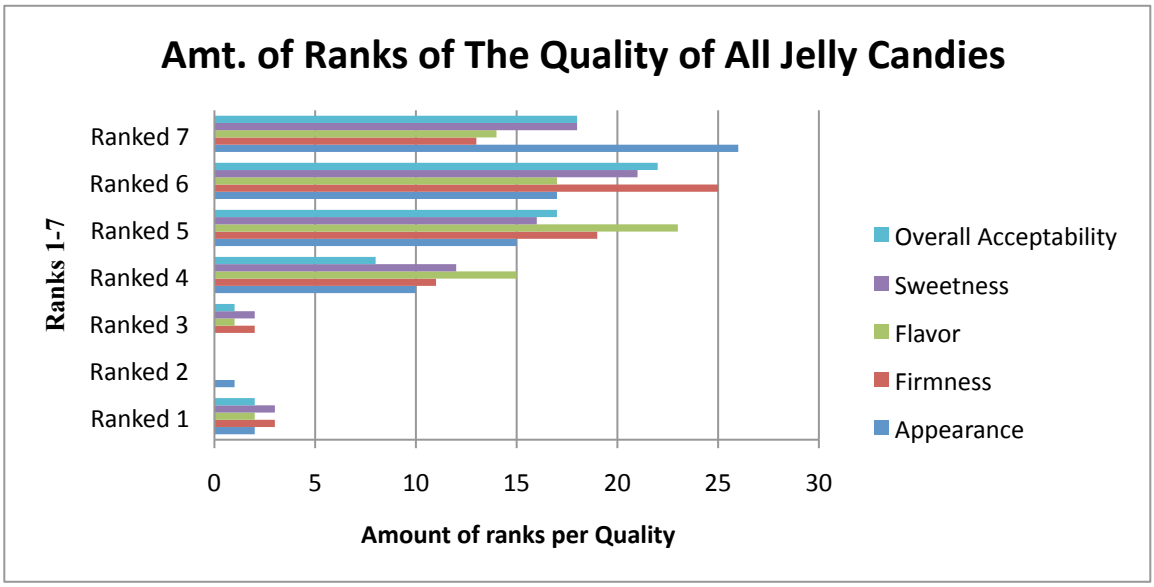
Table 2:

Amount of Rating of The Quality of All Jelly Candies

	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7
Appearance	2	1		10	15	17	26
Firmness	3		2	11	19	25	13
Flavor	2		1	15	23	17	14
Sweetness	3		2	12	16	21	18
Overall Acceptability	2		1	8	17	22	18

This Table shows that the highest ranks were a 7 in Appearance, 6 in firmness, 5 in flavor, 6 in sweetness and a 6 in overall Acceptability. 6 was the highest rank from ranks 1-5 and 7.

Graph 2:



This Graph shows that most of the panel ranked the all the recipe jellies as a 5, 6 or 7 compared to a 3, 2, 1.

Conclusion/Review of Literature:

According to the National Health and Nutrition Examination Survey (NHANES) between 2001-2004, children between the ages of 4-8 consumed an average of 21 teaspoons of added sugars, 17 more teaspoons of sugar recommended by the US Department of Agriculture food intake patterns as a means to maintain a healthy weight (Johnson, R. K., Appel, L. J., Brands, M., Howard, B.V., Lefevre, M., Lustig, R.H., Sacks, F., Steffen, L. M., Wylie-Rosett, J., 2009, August 24). In adding the total grams of sugar, the standard recipe contains 614.3 grams in comparison to extreme recipe which contains 358.3 grams (Allrecipes, 2012, Del Monte Foods, 2012, Knott's Berry Farm, n.d., Simply Orange Juice Co., 2012, Stewart, M., 2010, December), coming out to 10.2 grams of sugar per fruit jelly candy for the standard recipe and about 6 grams

of sugar for the extreme recipe. With 4 grams of sugar per teaspoon (Northridge, K., 2011, June 14), an extra teaspoon of sugar is contained in a piece of fruit jelly candy through the standard recipe.

Although using canned apricots verses fresh were a concern as far as added sugar content, it did not make much difference in the amount of sugar in teaspoons (0.41 gram difference) compared to the standard recipe (Self Nutrition Data, 2012). Canned apricots in light syrup were used instead of fresh apricots due to fresh apricots not being in season and the need of higher sugar content in canned apricots versus fresh. Because sugar plays a major role in firmness, taste, and wettability, we still needed a high enough sugar content for those quality purposes. Fresh apricots would have provided a more nutrient content in the recipe compared to canned apricots. Through findings, apricots can be a source for vitamin C, iron, potassium and fiber, yet it's an excellent source of vitamin A (Henderson, 2010). Canned apricots have higher amounts of sodium, calcium and iron compared to fresh apricots. Fresh apricots have higher contents of vitamin A and Vitamin C (Henderson, 2010). Since most Americans eat 42% of the recommended amount of fruits, most of them need to increase their fruit intake (Behrends, 2012). Apricots provides health benefits from phytochemicals for healthy eyes, protecting against heart disease, and lowering risk of some cancer (Behrends, 2012). Canned apricots in light syrup have 108 kcals for 6 halves and 3 medium fresh apricots have 51 kcals, which only accounts for a 57 kcal difference (Henderson, 2010). By replacing white granulated sugar with canned apricots in our jellies candies, the extreme jelly candies can increase the intake of apricot fruits for a person consuming them as a snack and at the same time with less sugar content.

The information presented suggests that having two fruit jelly candies from the standard recipe already meets the recommendation per the US Department of Agriculture's food

intake pattern for children ages 4-8 (four teaspoons), whereas the substituted recipe accounts for half of the recommendation, which would allow other means of added sugar in the diet without exceeding the recommended amount (Johnson, R. K., Appel, L. J., Brands, M., Howard, B.V., Lefevre, M., Lustig, R.H., Sacks, F., Steffen, L. M., Wylie-Rosett, J., 2009, August 24).

Added sugar means more calories, which is a factor children being overweight and obese. An important factor in prevention is through the "home environment," where children's eating behaviors are established (Dehghan, M., Akhtar-Danesh, N., Merchant, A. T., 2005, September 2). In being able to make the foods the child enjoys at home, there's control and ability in keeping track in the amount sugar put into those foods and how much of it is consumed. "More recently, a study released in 2009 by the University of Michigan Cardiovascular Center found that students who eat lunches served by their schools are more likely to be overweight or obese compared to children who bring their lunches from home. Not only were school-fed children more than twice as likely to consume fatty meats (25.8% versus 11.4%) and sugary drinks (36% versus 14.5%), but they also consumed fewer fruits and vegetables (16.3% versus 91.2%) (American College of Cardiology, 2010)." With that, making a snack of candy such as fruit jellies at home by substituting the sugar for fruit puree can decrease one teaspoon of sugar per fruit jelly, which would be significant when more than one fruit jelly candy is consumed. Controlling sugar intake within the home may help in preventing the over consumption of sugar and the overweight and obese epidemic children are facing today.

Although our research experiment went well in evaluations and sensory testing, more research needs to be done to conclude our apricot jellies as a healthier and less sugary snack.

References

American College of Cardiology. (2010). Children who eat school lunches more likely to be overweight. Retrieved May 26, 2010, from http://www2.med.umich.edu/prmc/media/newsroom/

Allrecipes (2012). *Cup to Gram Conversions*. Retrieved November 29, 2012, from http://allrecipes.com/HowTo/Cup-to-Gram-Conversions.

Behrends, D. U.S. Department of Agriculture , (2012).*Myplate: fruit group*. Retrieved from website: http://www.ianrpubs.unl.edu/live/g1606/build/g1606.pdf

Dehghan, M., Akhtar-Danesh, N., Merchant, A. T. (2005, September 2). Childhood Obesity, Prevalence, and Prevention [Electronic version]. *Nutrition Journal 2005,* 4:24. Retrieved November 29, 2012, from http://www.nutritionj.com/content/4/1/24.

Del Monte Foods (2012). Lite Apricot Halves [Data file]. Retrieved November 20, 2012, from http://www.delmonte.com/products/detail.aspx?id=88.

Harrison, J. A., & Andress, E. L. (n.d.). *Preserving Food: Jams and Jellies.* Retrieved November 29, 2012, from http://www.caes.uga.edu/extension/greene/fcs/documents/JAMANDJELLIES.pdf.

Henderson , A. E. (2010). Apricots. *Preserve the harvest*, Retrieved from http://extension.usu.edu/files/publications/publication/FN-2004-Harvest-02.pdf

Johnson, R. K., Appel, L. J., Brands, M., Howard, B.V., Lefevre, M., Lustig, R.H., Sacks, F., Steffen, L. M., Wylie-Rosett, J.,; on behalf of the American Heart Association Nutrition Committee of the Council on Nutrition, Physical Activity, and Metabolism and the Council on Epidemiology and Prevention (2009, August 24). *Dietary Sugars Intake and Cardiovascular Health: A Scientific Statement from the American Heart Association*. Circulation. 2009;120:1011–1020. Retrieved November 29, 2012, from

http://circ.ahajournals.org/content/120/11/1011.full.

Knott's Berry Farm (n.d.). Apricot Preserves [Data file]. Retrieved November 29, 2012, from http://www.knottsberryfarmfoods.com/ProductDetail.aspx?categoryId=383.

Northridge, K. (2011, June 14). *The Calories in 150 Grams of Sugar.* Retrieved November 29, 2012, from http://www.livestrong.com/article/286169-the-calories-in-150-grams-of-sugar/.

Josef, S. (2012, September 29). Carbohydrates, San Francisco State University. San Francisco, CA.

Self Nutrition Data (2012). Apricots, raw (Includes USDA commodity food A386) [Data file]. Retrieved November 29, 2012, from http://nutritiondata.self.com/facts/fruits-and-fruit-juices/1827/2.

Simply Orange Juice Co. (2012). Simply Apply Juice [Data file]. Retrieved November 29, 2012, from http://www.simplyorangejuice.com/.

Stewart, M. (2010). Fruit Jellies. *Everyday Food.* Retrieved October 2, 2012, from http://www.marthastewart.com/326899/fruit-jellies.