

# Increased Viscosity of Greek Yogurt Inoculate Among Yogurts Containing *Streptococcus thermophilus* and *Lactobacillus bulgaricus*



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Jacqueline Raetz-Vigon

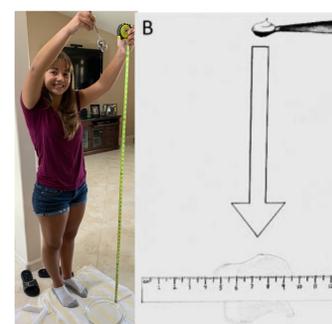
## BACKGROUND:

- Yogurt- generally dairy fermented by *S. thermophilus* and *L. bulgaricus* (Zhao et al., 2022)
- *S. thermophilus*- facultative anaerobe and safe opportunistic bacterial pathogen (Dan et al., 2018)
- *L. bulgaricus*- cannot effectively break down lactose by itself (Dahlan & Sani, 2017)
- Plain yogurt- milk lightly heated, starter culture added, split into servings (Smith, 2015)
- Vanilla- flavor added
- Greek- same fermentation, strained with cloth to eliminate whey and thicken (Delany, 2018)
- French- Fermented in small glass jars (Rossman, 2017)
- Hypothesis: differences in bacterial types, strains, and ratios and/or differences in production could cause differences in inoculate viscosity (Ha: Inoculate with Greek most viscous; H0: No difference)

## METHODS



**Figure 1. Yogurt Making:** 2tbsp of one of the four starting culture treatments was added to each of four containers of lightly heated milk and incubated in the oven with the light on for 8 hours. They were then refrigerated for 24 hours. There were 3 biological replicates per inoculate.

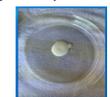


**Figure 2. Viscosity Assay-Splat Test:** Each person performed 5 technical replicates for each inoculate on each test for a total of 15 replicates per inoculate per test. Dropped yogurt from a height of 5 feet and 2 feet and measured the diameter of the yogurt (Figure 2B from Kuzmenko et al., 2022)

## RESULTS

The 5-foot and 2-foot splat tests yielded slightly different results, but the two foot splat test appeared to be more reliable.

2-foot splat test



5-foot splat test



**Figure 3.** "Splat" of inoculate with Greek yogurt starter when dropped from a height of 2 feet

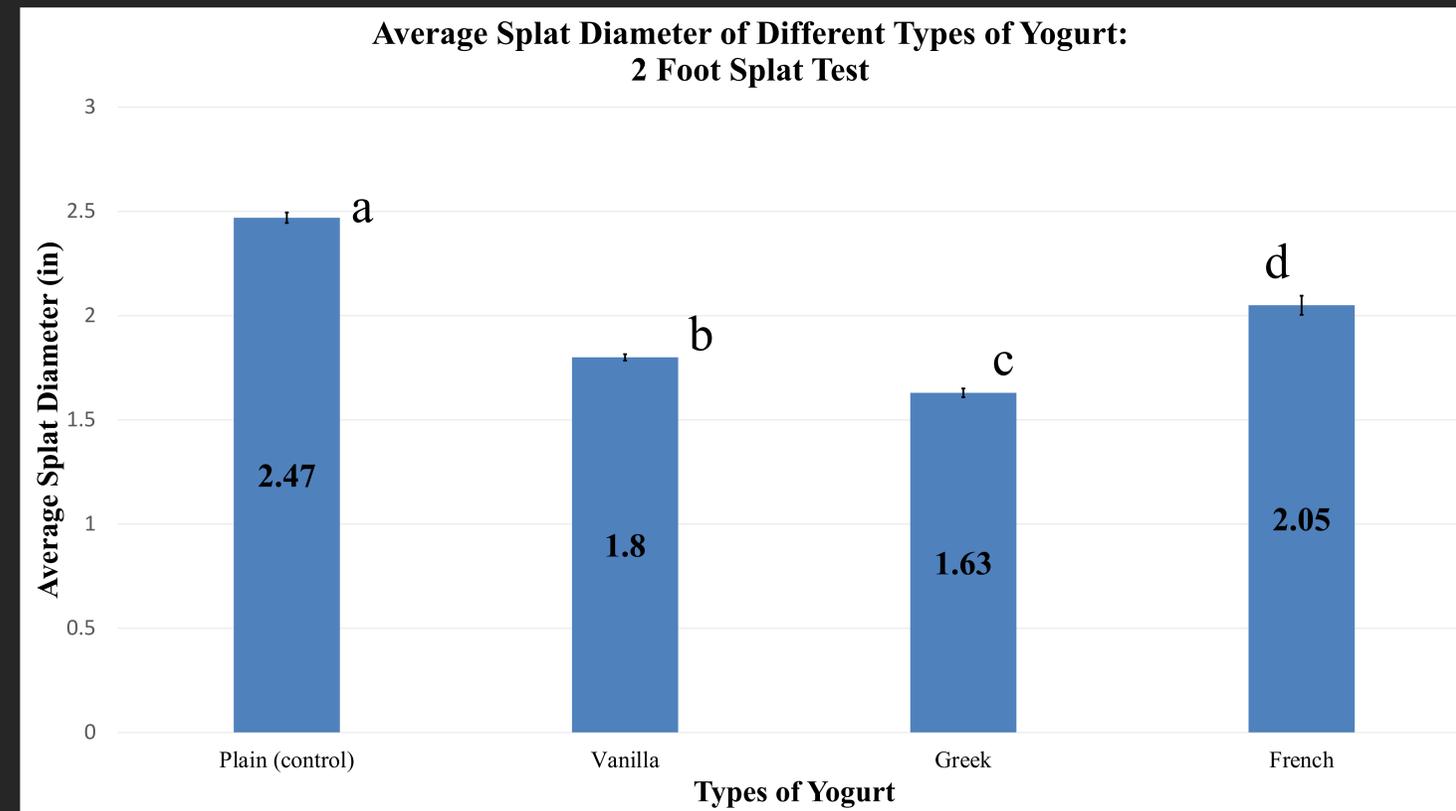
**Figure 4.** "Splat" of inoculate with Greek yogurt starter when dropped from a height of 5 feet

**Table 1.** The standard deviations of splat diameter for the 2-foot splat test were very small and generally lower than those of the 5-foot splat test

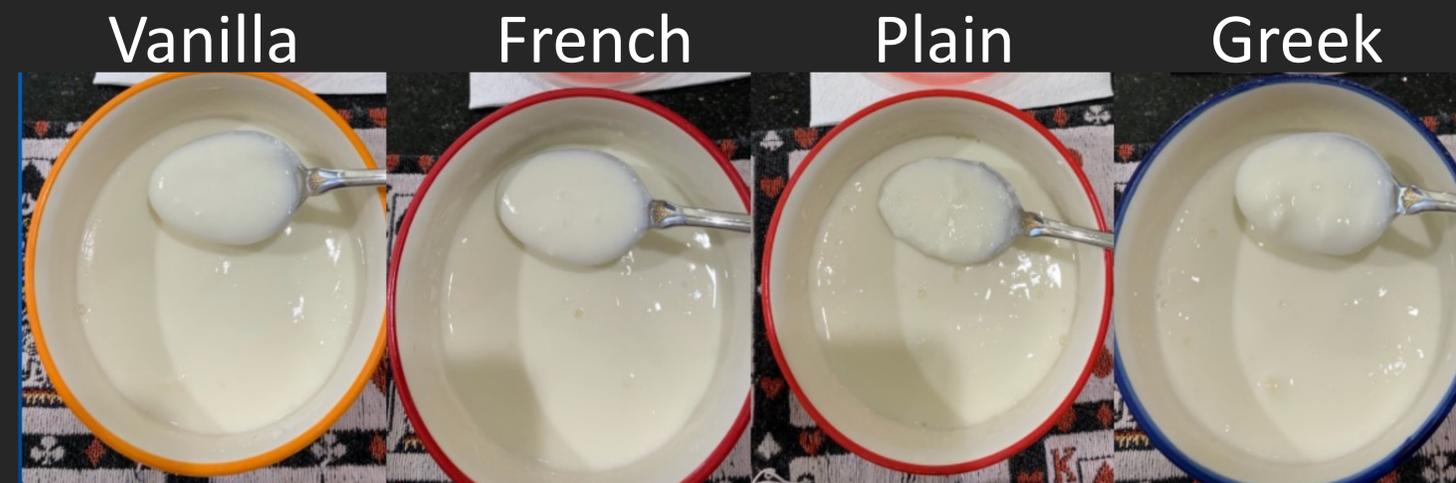
Yogurt Starter Type	Plain	Vanilla	Greek	French
Standard Deviation for 2-foot splat test	0.025	0.015	0.021	0.046
SD for 5-foot splat test	0.091	0.025	0.030	0.025

# Different yogurt starters make yogurts of different viscosity, with the Greek yogurt starter creating the most viscous inoculate.

Using the 2-foot splat test and an ANOVA, all yogurt viscosities were found to be significantly different. Yogurt from a Greek starter was most viscous, followed by that of the vanilla starter, French starter, and plain starter.



**Figure 5.** The Analysis of Variance test had an F-value of 472.69; a p-value of less than .0001; and degrees of freedom of 3,8.



**Figure 6.** Upon qualitative observation, Greek yogurt was by far the thickest, which was consistent with the results of the 2-foot splat test



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## DISCUSSION

Upon reviewing the literature, we believe a combination of bacterial differences, production differences, and sugar content differences are responsible for the varying inoculate viscosity.

### Bacteria:

- Different types of bacteria can change the viscosity of yogurt (Dahlan & Sani, 2017)
- **Table 2:** Comparison of Bacteria in Starter Yogurt Culture

Plain	Vanilla	Greek	French
<i>S. thermophilus</i>	<i>L. bulgaricus</i>	<i>S. thermophilus</i>	<i>L. bulgaricus</i>
<i>L. bulgaricus</i>	<i>L. lactis</i>	<i>L. bulgaricus</i>	<i>S. thermophilus</i>
<i>L. acidophilus</i>	<i>S. thermophilus</i>		
<i>B. bifidus</i>	(and probiotic bacteria)		
<i>L. casei</i>			

### Production:

- Can explain Greek and French differences but not plain and vanilla

### Sugar:

- Higher sugar concentration causes greater thickness (Prawiti et al., 2020)
- **Table 3:** Comparison of Sugar Concentration in Starter Yogurt Cultures

Plain	Vanilla	Greek	French
.75g/oz	3g/oz	1.13g/oz	3.02g/oz

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