

SCIENCE FAIR CENTRAL

MAKE. CREATE. EXPLORE.



STAIN REMOVAL PROJECT

Testable Question

Which is the best cleaning agent for removing stains?

Research

I started my research by talking to the home economics teacher at the local High School. She said that besides using commercial products, household items such as vinegar and baking soda also make good cleaning products. She also warned me never to mix vinegar with products containing ammonia as this could produce harmful vapors!

I researched on the internet and found the [Vinegar Institute](#). The organization provides information on the history of vinegar and the many ways that vinegar can be used. I saw a lot of ways that vinegar is used for cleaning.

I also looked up vinegar on an [online encyclopedia](#). Vinegar is good for cleaning chewing gum stains off clothes and can also be used as a fabric softener. I learned that vinegar contains acetic acid. When you combine baking soda and vinegar you get carbonic acid. Vinegar and baking soda are often used as cleaning agents.

Hypothesis

Vinegar and baking soda mixed together are best for removing stains from cotton fabric.

Why I think so: I think this because the carbonic acid that results from mixing the two substances together probably breaks down stains.

What I changed:

(Independent variables)

cleaning agents

What stayed the same:

(Controlled variables)

kind of fabric, type of stain, washing procedure

What I measured:

(Dependent variables)

the visibility of the stain after washing

Materials:

- mustard
- blueberry syrup
- ketchup
- prune juice
- water
- vinegar
- baking soda
- commercial pre-stain treatment
- commercial laundry detergent
- Q-tips
- watch/timer
- plastic cups for washing fabric swatches
- 100% cotton fabric swatches (approximately 3 inch squares)
- permanent marker for labeling





Procedure

1. Cut at least 28 pieces of 100% cotton fabric into approximately 3 inch squares.
2. Use a permanent marker to label each of the fabric pieces using all of the combinations of stain and detergent mixture. (stains= ketchup, mustard, blueberry syrup, prune juice; detergent mixtures=water, vinegar, vinegar and baking soda, commercial pre-treatment, commercial laundry detergent, vinegar and baking soda paste +laundry detergent, commercial pre-treatment + laundry detergent.
3. Place a stain on each sample according to the labels.
 W=water (50mL)
 V=vinegar (50mL)
 V+bs=vinegar +baking soda solution (30mL vinegar/20mL baking soda)
 cpst+w=commercial pre-stain treatment +water
 (20mL commercial pre-stain treatment +30mLwater)
 ld=laundry detergent +water (20mL laundry detergent+30mL water)vbp+ld=vinegar, baking soda
 paste + laundry detergent
 (10mLvinegar+40mL baking soda)+(20mL laundry detergent +30mL water)
 cpst+ld= commercial pre-stain treatment + laundry detergent
 20mL commercial pre-stain treatment +30mLwater) + (20mL laundry detergent+30mL water)
4. Place each sample in the detergent mixture and scrub for 2 minutes.
5. Remove excess liquid and compare the samples when they are dry.

Stain Removal Effectiveness Scale:

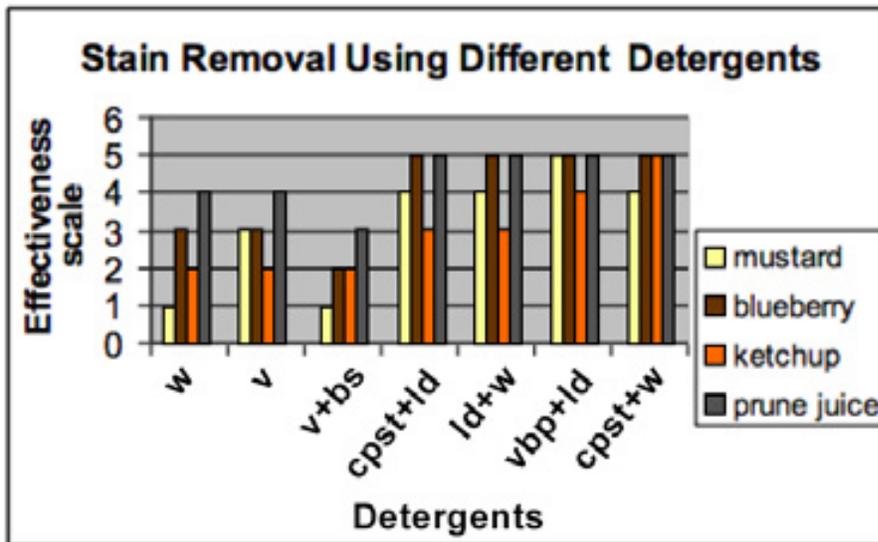
5= highly effective (stain gone) 4=slightly visible 3= faded 2=no change 1=worse

Stain Removal Data				
	Mustard	Blueberry	Ketchup	Prune Juice
Water	1	3	2	4
Vinegar	3	3	2	4
Commercial laundry detergent	4	5	3	5
Vinegar and baking soda solution	1	2	2	3
Commercial pre-stain treatment with water	4	5	3	5
Pre-stain vinegar and baking soda paste and commercial laundry detergent	5	5	4	5
Commercial pre-stain treatment with commercial laundry detergent	4	5	5	5



Qualitative Observations:

In almost every example, the stain got at least a little bit lighter. However, some stains actually got worse when put in the different solutions. For example, the mustard stain actually got darker gold when put in vinegar and baking soda solution. The blueberry syrup stain turned green and brown when put in the vinegar and baking soda solution.



Key:

w=water

v=vinegar

v+bs=vinegar + baking soda solution

cpst+w=commercial pre-stain treatment +water

ld=laundry detergent + water

vbp+ld=vinegar, baking soda paste + laundry detergent

cpst+ld= commercial pre-stain treatment + laundry detergent

Mean Average Score on Stain Removal Effectiveness Scale*

Water	2.5
Vinegar	3.0
Commercial laundry detergent	4.25
Vinegar and baking soda solution	2.0
Commercial pre-stain treatment with water	4.25
Pre-stain vinegar and baking soda paste and commercial laundry detergent	4.75
Commercial pre-stain treatment and commercial laundry detergent	4.75

Stain Removal Effectiveness Scale:

5=high effective (stain gone) | **4**=slightly visible | **3**=faded | **2**=no change | **1**=worse



Results/Conclusions

The results show that the best way to remove stains is to use either a combination of vinegar and baking soda paste + commercial laundry detergent or to use a combination of commercial pre-stain treatment + laundry detergent. Both of these treatments scored a mean average of 4.75 on the effectiveness scale (5 being the most effective). My hypothesis was only partly accurate. I thought that just washing the stain in a vinegar and baking soda solution would be enough to remove the stain. What I found was that using more baking soda to make vinegar and baking soda paste then combining it with laundry detergent was the best way to remove most stains. This even worked better than using the laundry detergent alone or the commercial pre-stain treatment alone. Since the commercial pre-stain treatment combined with laundry detergent did not appear to remove stains any more effectively than the homemade vinegar and baking soda paste + laundry detergent, I would recommend people purchase baking soda and vinegar since it is the cheaper and more eco-friendly product.

