Sage Garden Project: Nutritional Science Lab

Concept: Emulsions

Emulsion Salad Dressing

A fifty-minute lesson for grades 3-5.

Outcome:
Students further their knowledge of emulsions and how they function in cooking.

Vocabulary words: emulsion, solution, solubility (or water-soluble), vinaigrette, mayonnaise (spelling!), non-reactive, EVOO, drizzle

Preparation/Materials:
Screw-top jars prepared for demonstration:
2 T oil + 1 cup water
2 T oil + 1 cup water + 4 drops of food coloring
2 T oil + 1 cup water + 4 drops of food coloring + 1 T dish soap

Recipe ingredients
Garden produce for salad: greens, lemons, lettuce, radishes
Cucumbers, yellow peppers, oils, edible flowers

Opening Discussion:

Ask if a student can define an emulsion for the class.

Explain and demonstrate Emulsions and Solutions for the class.

Solution: one substance disolved in another, such as salt + water = saltwater
Emulsion: one substance suspended equally in another, as we will demonstrate

In simplest terms, an emulsion is a mixture of two liquids that don't ordinarily mix.

1) Do you know how oil and water don't mix? Here's a container with oil and water in it. (Give it to a student to shake up.) It looks like it gets mixed, but once we set it down, it settles back into the two separate liquids.

2) In this jar, we have added food coloring. Look how it mixes (or has mixed) with the water, but not the oil. That's because it's water soluble, which means it becomes a solution – effectively dissolved into the water. But see how the oil still remains separate.

3) Then, we add the emulsifier – the agent which will combine the liquids and keep them combined. In this example, we've used dish soap. See how everything becomes one substance, and it should stay mixed – so check back during class to see if it becomes separated.

How can we use this concept in cooking?

Today, we are going to practice making one of the most common emulsions, which is salad dressing. We know that some ingredients are very good emulsifiers, mustard, egg yolks, and even mayonnaise (which is itself an emulsion made with egg yolks!). Most salad dressings are based on oil and vinegar, which do not normally mix. Today, we are using oil and lemon juice, and we will make use of both mustard and mayonnaise as our emulsifiers.

Have students wash their hands.
When presenting this lesson onsite, you may delight students by dropping a bit of dry ice in a styrofoam or plastic cup with some dish soap in it. The soap will bubble and overflow, and you can hold it over the students' cupped hands, providing each student with some soap bubbles. This works like a hand-sanitizer, they rub their hands together until it disappears.

Action:
Walk students through each step
Begin by making emulsion/dressing:

Job 1 – indicate students on right end of table to begin tasking:
show students how to use knife, down on cutting surface

Job 2 – next student takes half of lemon and uses juicer
Job 3 – next student takes remaining half of lemon and uses juicer

Job 4 – next student measures **1 T lemon juice** into screwtop container

Job 5 – next student measures **1/2 t mayo** into container
Job 6 – next student measures **1/2 t mustard** into container

Job 7 – **next THREE students each measure 1 T olive oil in**

Job 8 - next student adds **3 shakes of salt**
Job 9 – next student adds **3 grinds of pepper**

Job 10 – next student screws top on, shakes while class sings a song – can pass it
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Job 11 – prep greens – must be dry, stemmed, leaves torn into bite-sized pieces

Demonstrate chopping and grating techniques

Job 12 – clean and chop yellow pepper and add to salad bowl
Job 13 - chop cucumber and add to salad bowl
Job 14 – grate carrots and add to salad bowl
Job 15 – add dried fruit

Job 16 – toss salad
Job 17 – add dressing - *drizzle*
Job 18 – dish up salads
Job 19 – decorate salads with flowers
Job 20 – serve salads

Closing Discussion (can take place while students are eating):
Take another look at demo emulsion, ask if they remember the word, review science of emulsion and solution.

Cleanup: 5 minutes
Have students pick up spilled items on tables and floors, and put into trash as they line up to leave the area.

Recipe – Lemon Vinaigrette
1 T lemon juice
1/2 t regular or light mayonnaise
1/2 t Dijon mustard
1/8 t salt
Couple grinds of fresh pepper
3 T EVOO

Shopping/materials list:
Instructor knife & cutting board, apron
3 big salad bowls
3 cutting boards + 6 cutting mats
3 graters
6 knives
3 juicers
6 screwtop plastic containers
3 tongs
salt & pepper
oil
mayo
mustard
3 lemons
Tablespoon - 3
1/2 teaspoon – 3
bowls
forks
napkins
cleanup towel

food coloring
dish soap
water
cheap veg oil

salad greens
big carrots (with tops?) to grate
nasturtium flowers
croutons?
dried fruit
yellow peppers
cucumber

recipe printouts

DRY ICE!
Gloves or hot hand

Lemon Vinaigrette – Emulsion – Salad Dressing

Ingredients:
1 Tbsp freshly-squeezed lemon juice
1/2 tsp mayonnaise
1/2 tsp Dijon mustard
3 Tbsp extra virgin olive oil (flavor-infused is good)
a few turns from pepper grinder
a couple shakes of salt

Directions:
Step 1
Combine lemon juice, mayonnaise, mustard, salt and pepper to taste in small, non-reactive bowl. Whisk until mixture is milky in appearance and no lumps of mayonnaise remain.

Step 2
Place oil in a small measuring cup so that it is easy to pour. Whisking constantly, very slowly drizzle oil into lemon juice mixture. If pools of oil are gathering on surface as you whisk, stop addition of oil and whisk mixture well to combine, then resume whisking in oil in slow stream. Vinaigrette should be glossy and lightly thickened, with no pools of oil on its surface.

(Vinaigrette can be refrigerated for up to 2 weeks.)

Dress and serve salad:
1/4 c dressing should cover 8-10 c lightly packed greens, which is enough for 4 full-sized servings (our classroom servings should be more like 1 cup each). The vinaigrette should lightly coat the salad greens and there shouldn't be so much dressing that it collects at the bottom of the bowl.

Sage Garden Project is pleased to provide support to the school garden program at elementary schools in California. As one of many programs supported by the Anthony Cerami and Anne Dunne Foundation for World Health, the Sage Garden Project is dedicated to improving children's health through garden and nutrition education and practice, using hands-on, science-based lessons to fight obesity and diabetes in particular. Volunteers and corporate community partners are cherished contributors to the success and continued operation of this dynamic program on this campus. Visit us online at sagegardenproject.org or on our Facebook page.