

615 midterm project

Introduction & Data

USDA Data on pesticides used on strawberries for California, Florida, Oregon, and Washington, from 2016 - 2019

Toxicity records on different toxins.

Question

If the toxicity level of toxins would leave to lower usage of toxins in terms of lbs?

Exploration

According to Table 1, we can see that for chemicals that are used with lbs measurement, there is no pesticides that are categorized as high toxicity level. Washington only has one pesticides that were used with measurment in lbs and it was back in 2016. The highest usaged of pesticides in terms of absolute lbs was in Florida in 2016, and the toxicity level is low.

``summarise()`` has grouped output by 'State', 'Year'. You can override using the ``.groups`` argument.

Table 1.Absolute usaged of chemicals at different toxicity level by year

State	Year	toxicity_level	value
CALIFORNIA	2016	Low	NA
CALIFORNIA	2016	Moderate	NA
CALIFORNIA	2016	No	NA
CALIFORNIA	2018	Low	NA
CALIFORNIA	2018	Moderate	NA
CALIFORNIA	2018	No	NA
CALIFORNIA	2019	Low	NA
CALIFORNIA	2019	Moderate	NA
CALIFORNIA	2019	No	NA
FLORIDA	2016	Low	NA
FLORIDA	2016	Moderate	NA
FLORIDA	2016	No	NA
FLORIDA	2018	Low	NA
FLORIDA	2018	Moderate	NA
FLORIDA	2018	No	NA
FLORIDA	2019	Low	NA
FLORIDA	2019	Moderate	NA
FLORIDA	2019	No	NA
WASHINGTON	2016	Low	150

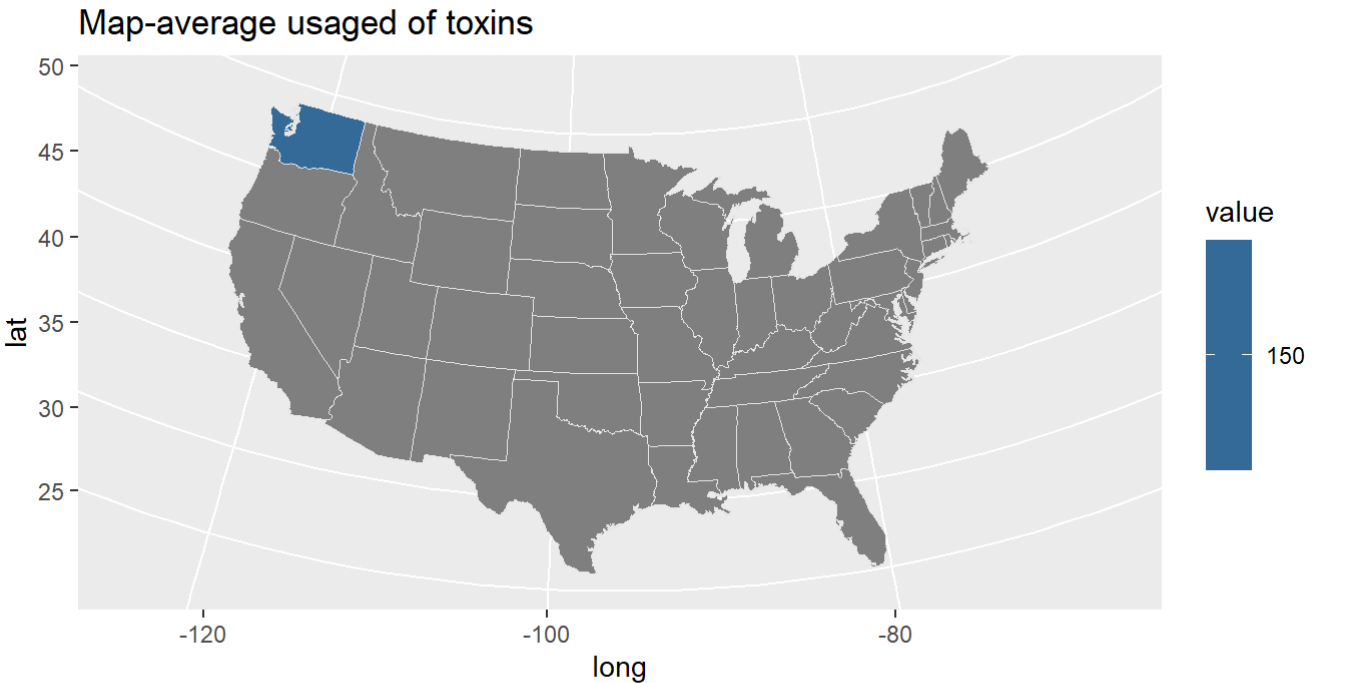
According to Table 2, we can see that California in general have more records of using Lbs to measure toxins' usage. While in Washington and Florida, the number is much less.

``summarise()`` has grouped output by `'State'`. You can override using the ``groups`` argument.

Table 2.Total count of chemicals all used
in absolute LB by state and toxicity
levels

State	Low	Moderate	No
CALIFORNIA	35	18	24
FLORIDA	5	7	5
WASHINGTON	2	NA	NA

According to map 1, we can know that the Florida has the highest average lbs used in toxins, despite of the fact that the number of the toxins using lbs as measurement in California is much higher. Washington has the lowest toxins used in absolute lbs.



Modeling

To better understanding the relationship between toxicity level and the usage of pesticides measured in lbs, we decided to run a simple regression to explore the relationship.

According to the result below, we found no linear regression relationship between if the pesticides are toxic and the level of its toxicity, and the usage of the pesticides (measured in lbs).

```
fit <- lm(Value ~ toxicity_humanbee_cat+toxicity_level_cat, data = agg_df2)
summ(fit)
```

Observations	399 (734 missing obs. deleted)
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Dependent variable	Value
Type	OLS linear regression
F(2,396)	1.65
R2	0.01
Adj. R2	0.00

	Est.	S.E.	t val.	p
(Intercept)	31.99	15.72	2.04	0.04
toxicity_humanbee_cat	-15.17	8.43	-1.80	0.07
toxicity_level_cat	15.57	10.48	1.49	0.14

Standard errors: OLS

Conclusion

Despite that we didn't find a relationship between the toxicity, toxicity level and the usage of pesticides (measured in lbs) on Strawberries. There are 3 reasons that could lead to the weak relationship and could be improved in future study. 1. The data we have are very limited, covering only 3 years with states data. 2. Also, the data only focused on pesticides used on strawberries, which is very specific perspective. Due to the concentration of strawberry production in California (90%) and Florida (8%)¹ and large differences in natural environments in California and Florida, localized toxicity of pesticides needs to be considered. 3. Current model only focused on the the usage of pesticides that are measured in lbs. Considering the different land sizes and population concentrations, proportional usage could be considered for future studies.

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1. "U.S. fresh strawberry production expands with newer varieties", USDA. May 19, 2021.
<https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=101156>
 (https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=101156)↵