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Aqua Phoenix™

How many seeds does a pomegranate have?

AND

Does a larger pomegranate yield proportionally more seed volume?

Pomegranates are curious fruits - apple-sized, red in color, and containing hundreds of pitch-red juicy seeds. Bitter-sweet in taste, depending on ripeness, puts these delightful transparent fragilities in-between grapefruits and red grapes.



Figure 1.1

[Click image to enlarge](#), or [click here to open](#)

What has nature blessed us with - the pomegranate is a very unstructured structured fruit. It contains multiple compartments, each tightly packing seeds around a sponge-like center, in some more or less random formation.



Figure 1.2

[Click image to enlarge](#), or [click here to open](#)

Sources are in disagreement about how many seeds a pomegranate holds. Some sources fix the number to exactly 613, some allow for an error of +/- 200, yet others believe that all pomegranates have the exact same number of seeds. It is certainly possible to disprove the first and third of these.



Figure 1.3
Click image to enlarge, or click [here](#) to open

Then how many seeds are in a typical pomegranate? Here we keep track of a very small number of pomegranates, carefully dissected and accounted for. This is an on-going experiments, and depending on mood and taste buds, the table will be filled with additional pomegranates.



Figure 1.4
Click image to enlarge, or click [here](#) to open

Next to the number of seeds in a pomegranate, another phenomena is its highly varying size. Does size matter? We assume that a larger pomegranate yields proportionally more seed volume, but this is not quite true.

Recently, we have begun annotating our new additions to the dataset with data for volume. For each new pomegranate, we measure its total volume, and, after careful counting of seeds, we measure the total seed volume. The plotted and curve-fit data shows that with increasing total volume (which is highly correlated to weight), the volume of extracted seeds grows logarithmically. That is, seed volume grows only marginally with size and weight. While the dataset is still small, the computed logarithmic curve fits to the dataset with a relatively small error (R-squared tends towards 1).

These results are not surprising. When comparing the amount of pulp in a large pomegranate to that of a small one, you will notice that the shell of a large pomegranate is significantly thicker.

1. Statistical Summary

Country	Sample Size	min #seeds	max #seeds	avg #seeds	min weight (g)	max weight (g)	avg weight (g)
US	150	286	1370	680	145	1065	421
Singapore	2	339	579	459	250	400	325
Iran	37	165	1263	338	200	660	354
Spain	2	580	837	709	280	330	305
Turkey	12	267	971	576	226	1001	603
Brazil	3	647	1054	809	568	658	599
All	206	165	1370	613	145	1065	420

Table 1.1: Pomegranate Statistics (download the data file for a complete listing of each pomegranate)

2. Data and calculation source

Download the Matlab code for the distribution shown in Figures 1.5 and 1.6. All three files are required.



[Pomegranate Distribution and Regression m-file](#)



[Pomegranate Dataset \(1\)](#)



[Pomegranate Dataset \(2\)](#)

3. Graphs and regression

Pomegranates of different sizes and origins have a highly varying number of seeds. Pomegranates from Iran tend to be small, but have very large and sweet seeds. Pomegranates from the U.S. come in all sizes and their seeds can be anywhere from bitter to sweet. With increasing number of seeds per pomegranate, size and weight per seed decreases. The relationship can at best (low R^2 value) be described as an inverse relationship. (see Figure 1.5)

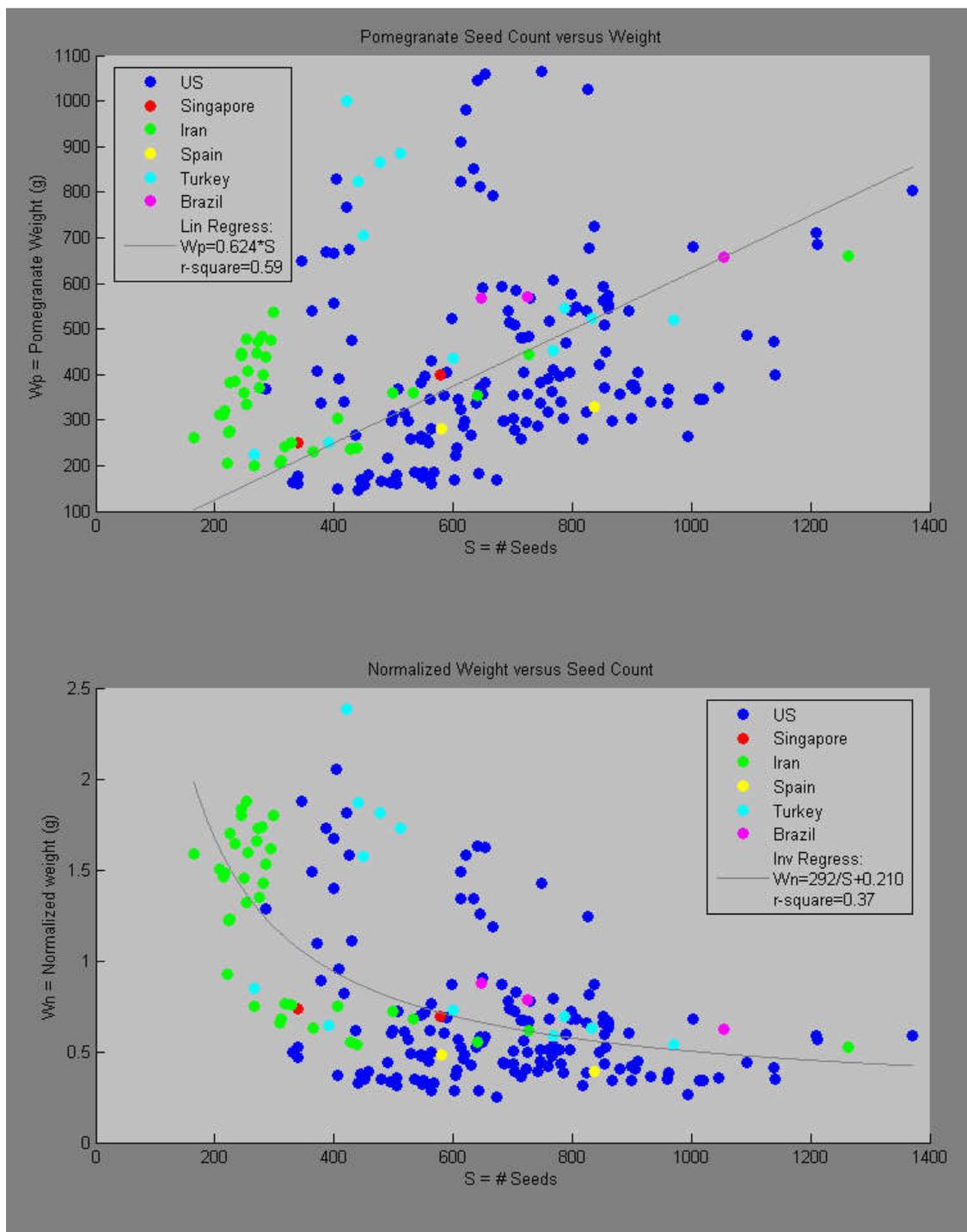


Figure 1.5: Distribution of weight and seed count by country of origin

With increasing size and weight of a pomegranate, the volume of seeds grows only marginally. This relationship can be well described (high R^2 value) by a logarithmic function. (see Figure 1.6)

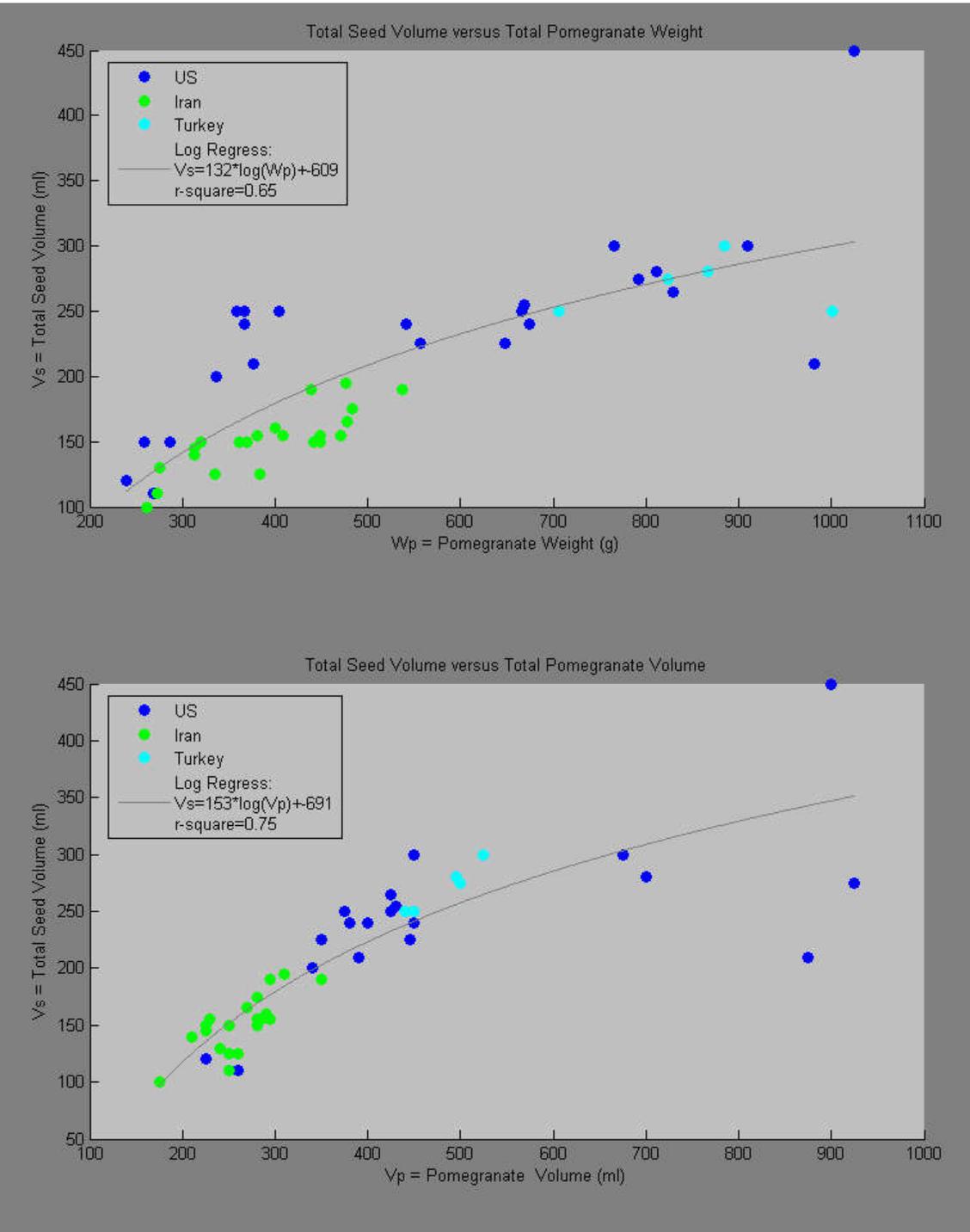


Figure 1.6: Distribution of weight and volume by country of origin