# Harvester Ant Cover Crop Seed Preference

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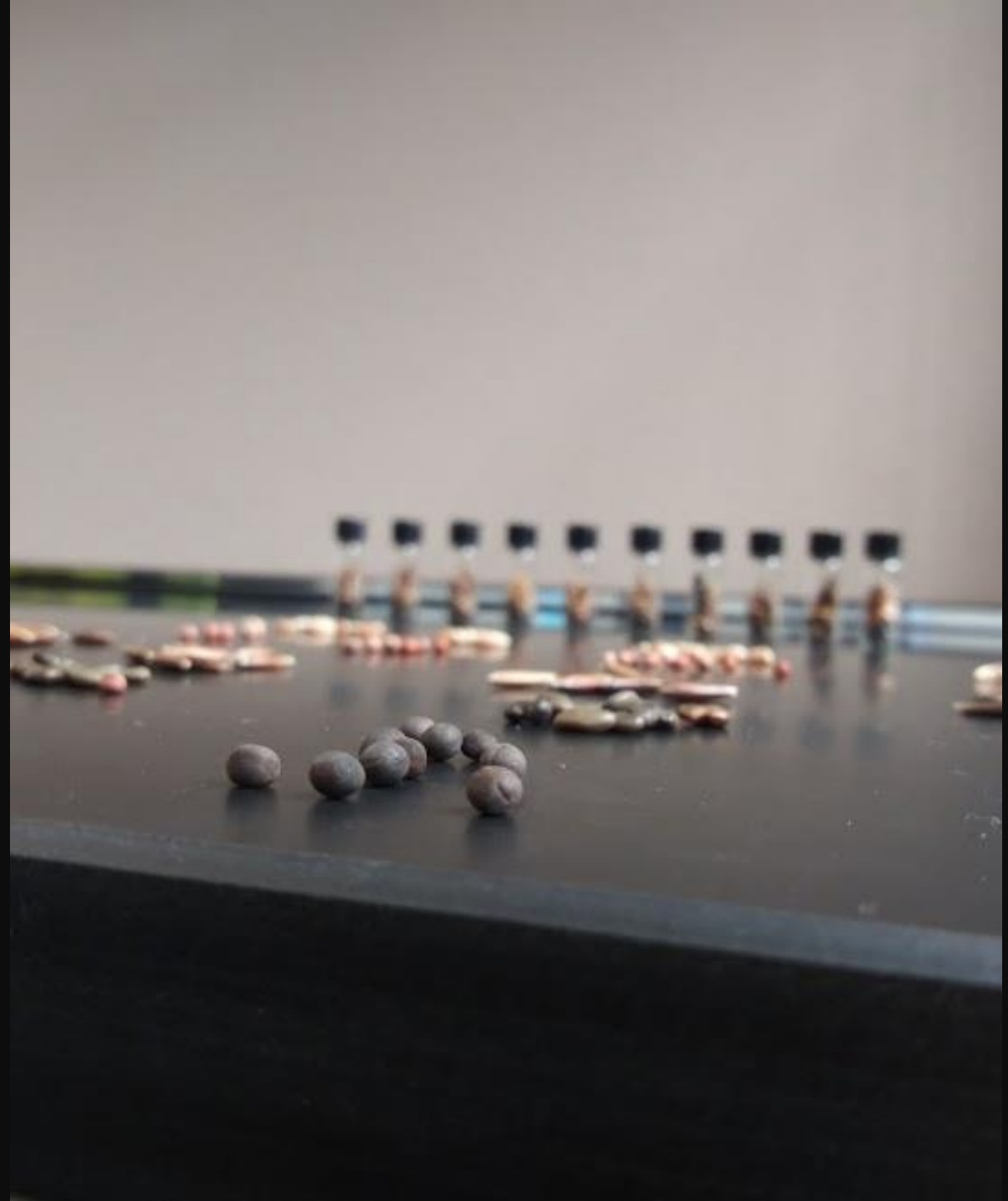
# Why?

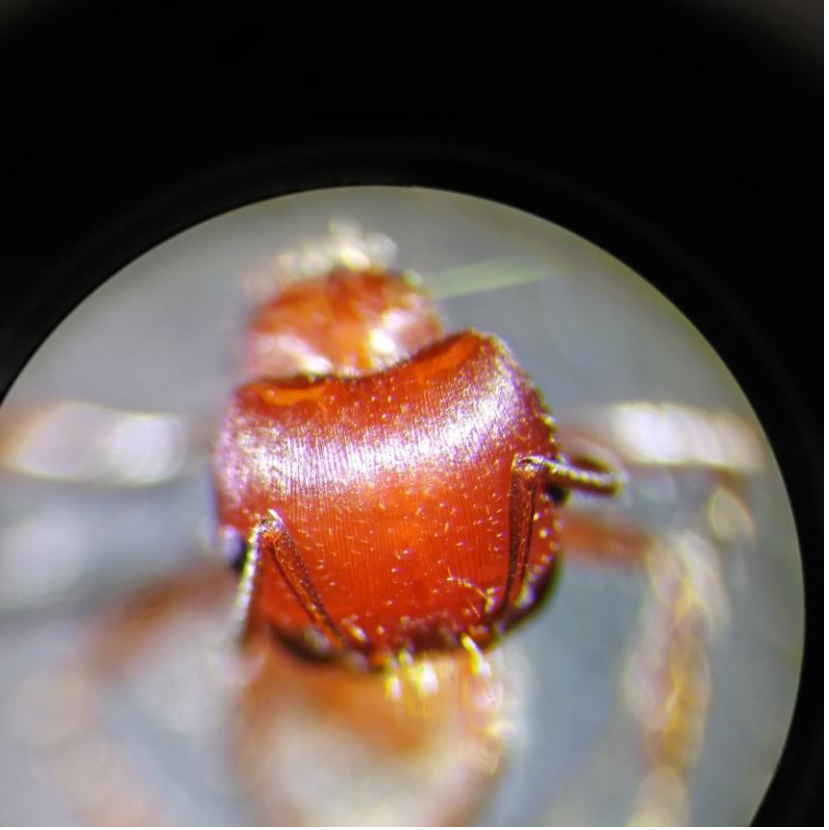
- Negative Impacts on organic farmers
- A Threatened Predator
- Population Decline
- Invasive Species



Harvester colony disks in an agricultural (left) versus an urban (right) setting

# Harvester ants (*Pogonomyrmex*)

- Habitat loss
- Anthropogenic disturbance
- Economic loss
- Pesticide use



A. *Pogonomyrmex* worker

*B. P. barbatus* foragers consuming an army worm found in a corn field. Photo taken at local organic farm.

C. *Pogonomyrmex* Queen

- Inhabited Region
- Colony size
- Individuals' description
- Food preferences

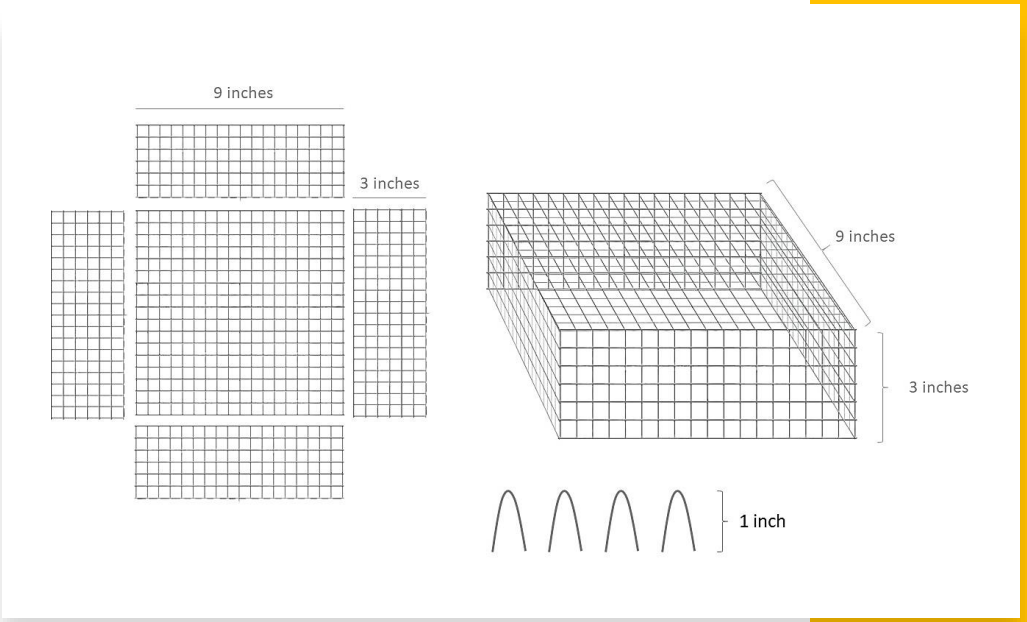
# Experimental Design

Seed Choice Assay

- Colony requirements
  - Visible disk with midden pile
  - Visible trail extending from colony
  - Active colonies only
- Field Design
  - Protective Covering
  - Seed housing

# Seed Preference trial details

- Duration: 24 hours
- Seed Counts conducted after 1, 2, 4, and 24 hours.
- Extra annotations included:
  - Appearance of foreign items in dish (e.g., corpses, rocks, other seeds…)
  - Temperature (°F)
  - Cloud Cover (%)
  - Wind Speed (mph)




# Survival Analysis

$$S(ti) = \frac{n\ subjects\ at\ risk\ at\ start\ - n\ subjects\ that\ died}{n\ subjects\ at\ risk\ at\ start}$$

$$S(t_i) = S(t_i - 1) * (1 - \frac{n\ subjects\ that\ died}{n\ subjects\ at\ risk\ at\ start})$$

$$S(ti) = Survival\ probability$$

$$S(t_i) = S(t_{i-1}) * \left(1 - \frac{d_i}{n_i}\right)$$

# Basic Methodology

- Remove null values from dataset
- Create an object (Kaplan-meier fitter)
- Create new column named ‘dead’
- Assign values to dead based on value in data column
- (data = 8, dead = 0) and (data = 0, dead = 1)
- Within object, assign data column to ‘durations and event_observed (dead?)
- Create event table.
- Plot the object, repeat for samples

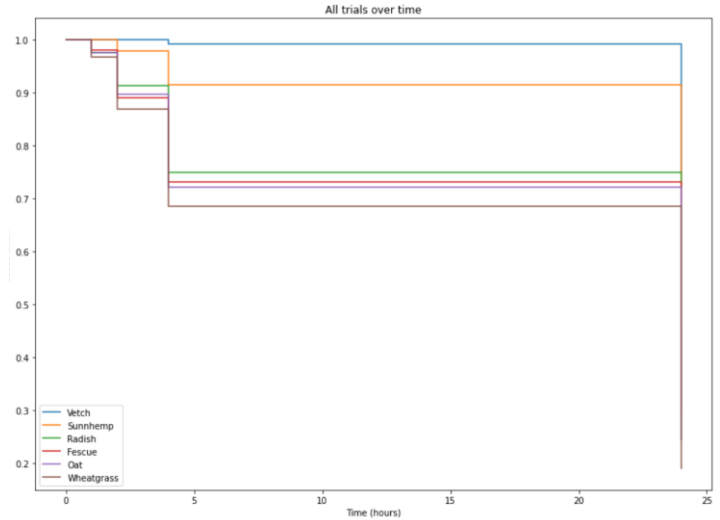
```
kmf_r = KaplanMeierFitter()
```

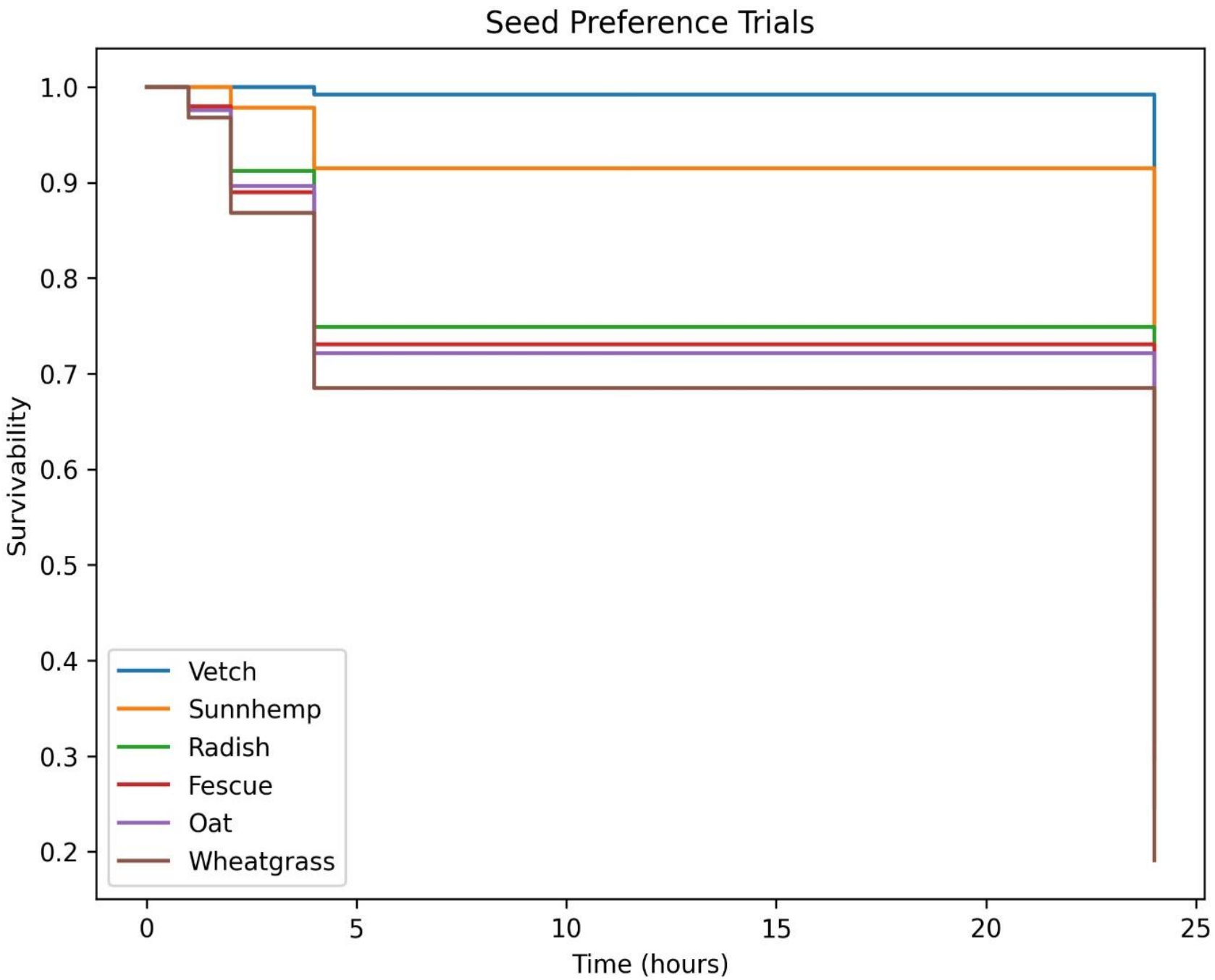
```
ant.loc[radish == 10, 'dead'] = 1
ant.loc[radish != 10, 'dead'] = 0
```

```
kmf_r.fit(durations = ant['Time point'], event_observed = ant['dead'])
```

```
kmf_r.predict([0,1,2,4,24])
```

```
0     1.000000
1     0.975709
2     0.912419
4     0.749222
24    0.245647
Name: KM_estimate, dtype: float64
```

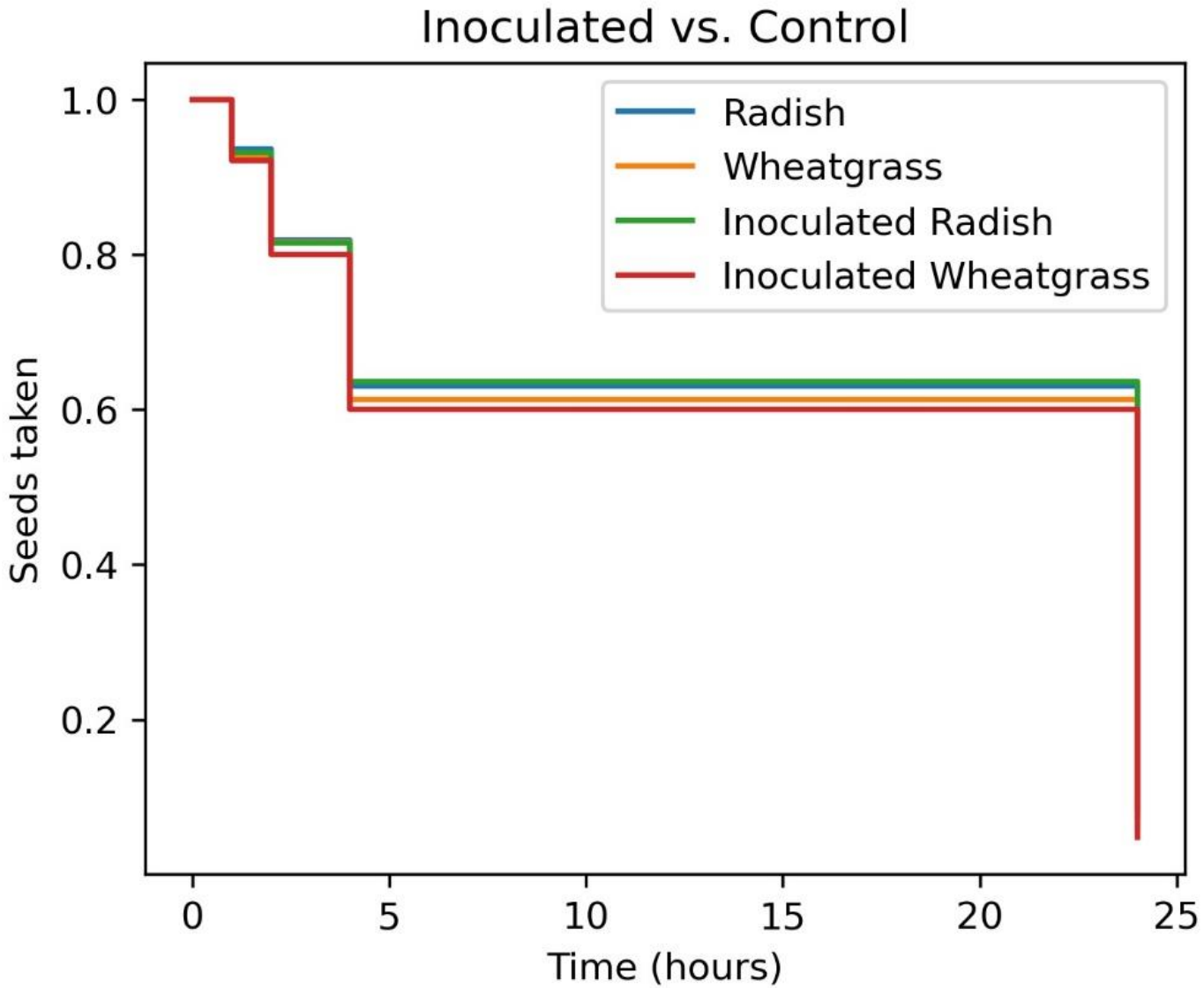





| test_statistic | p | -log2(p) |
|---|---|---|
| 81.19 | <0.005 | 62.08 |

# Inoculation Trials

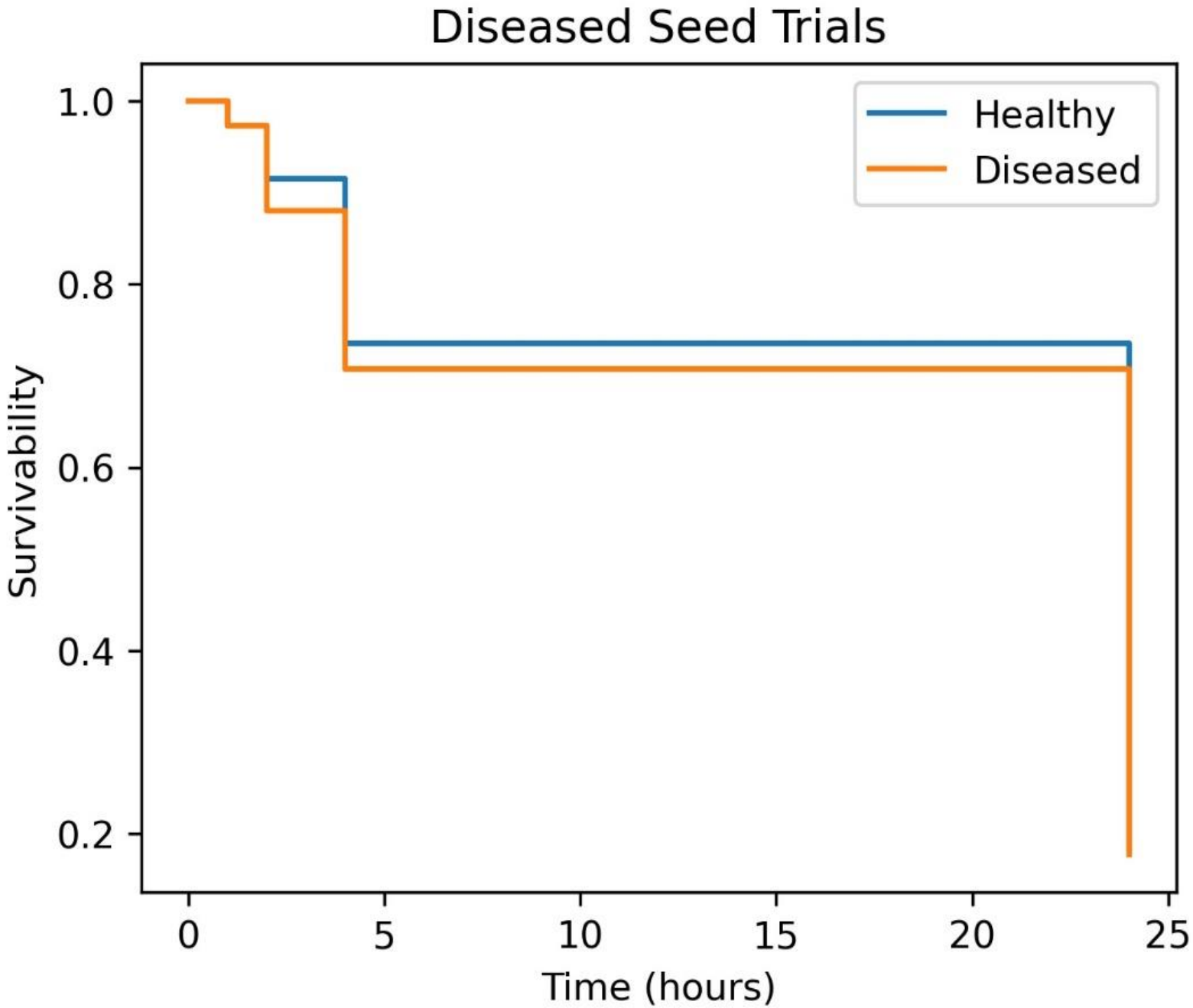
- Two most preferred seeds were used for this choice assay.
- Would a favorite seed be rejected post-inoculation? Or would survivability decrease?




| test_statistic | p | log2(p) |
|---|---|---|
| 0.33 | 0.6 | 0.82 |

# Diseased-Seed Head trials

- What is the relationship between ants and disease seed dispersal?
- Will these ants pose a risk of collecting large amounts of




| test_statistic | p | -log2(p) |
|---|---|---|
| 0.19 | 0.66 | 0.6 |

# Conclusion

- Significant difference between preference of Vetch and Sunhemp and Radish, Wheatgrass, Fescue, and Oat.

- Diseased Seed heads, and seed inoculation cause no significant difference in harvester ant seed preference.