Peat flammability investigation 2.0

Year 2 update

Who’s done what?

Muhammad Salman Razak – what the data tells us (water loss)

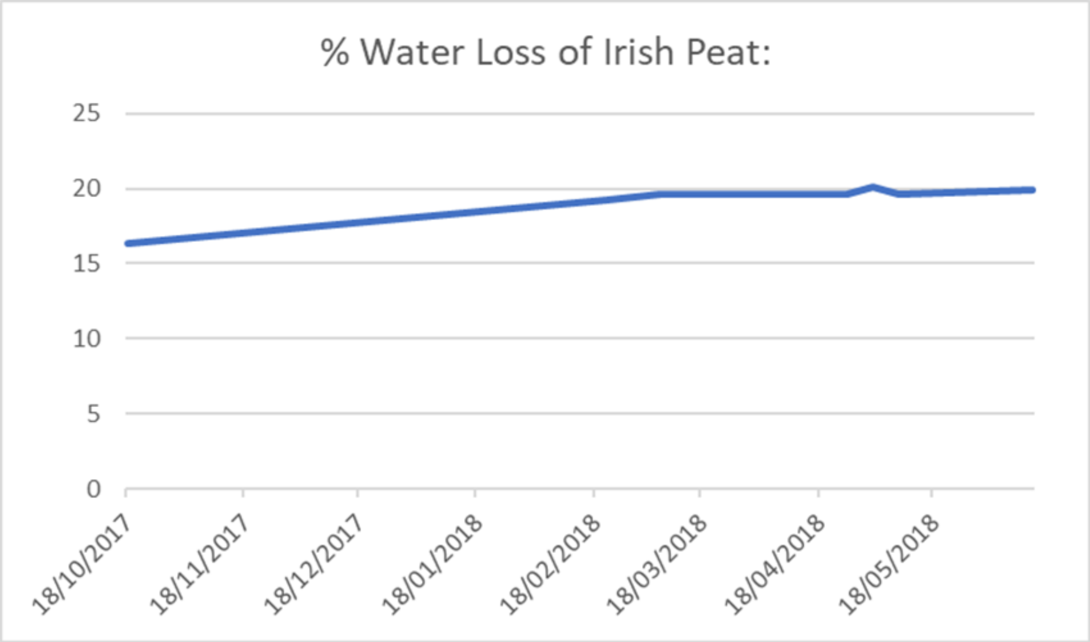
Pagane Gacheva - effects of the year’s weather patterns

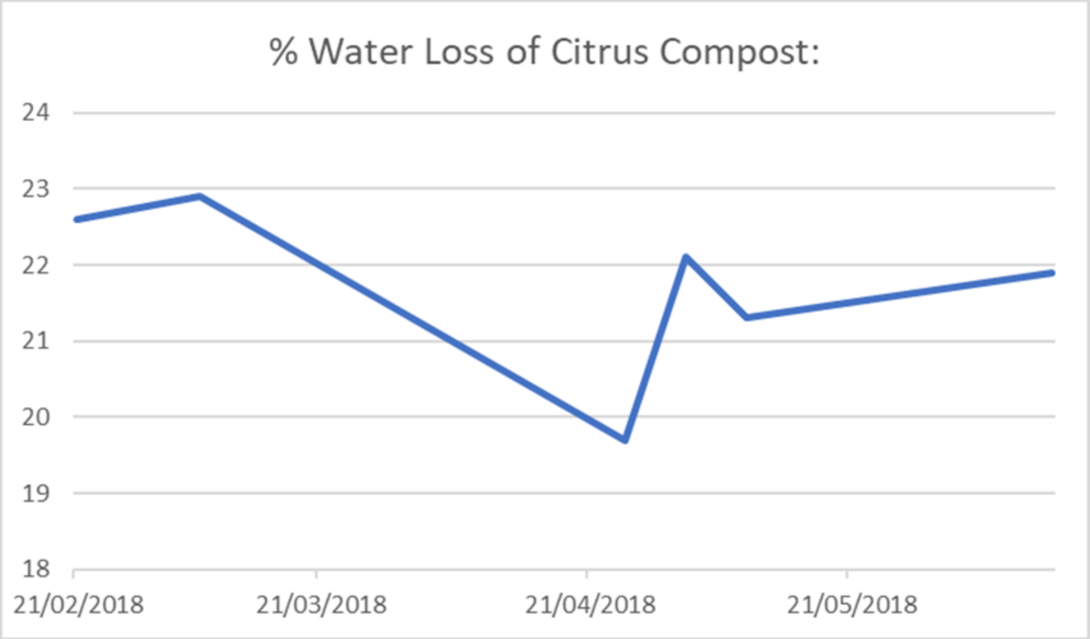
Jamie Smith – limitations & improvements

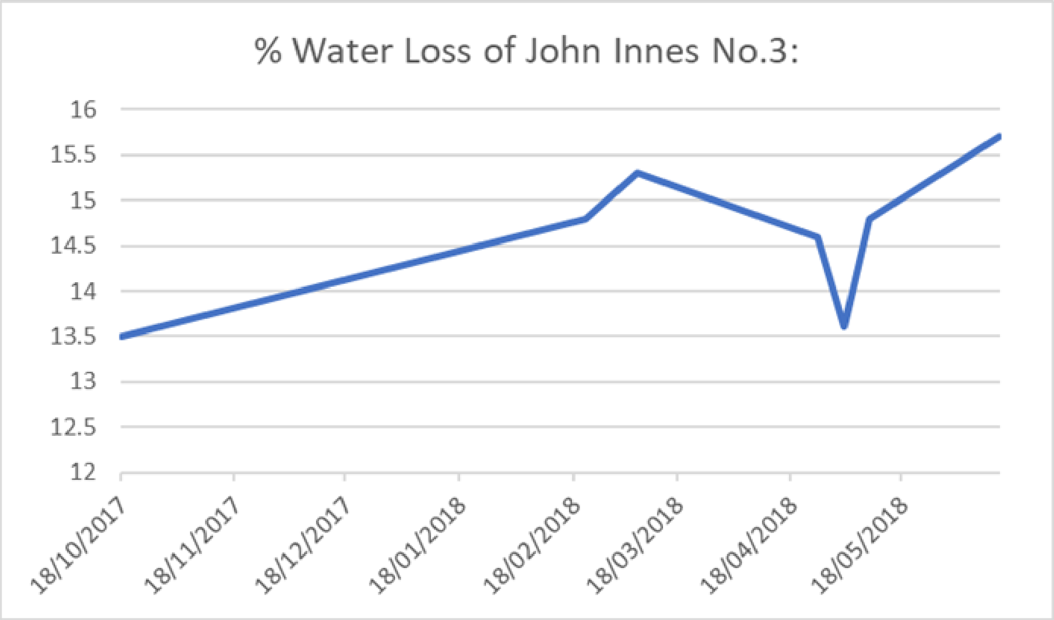
Muhsin Razak – overall conclusions

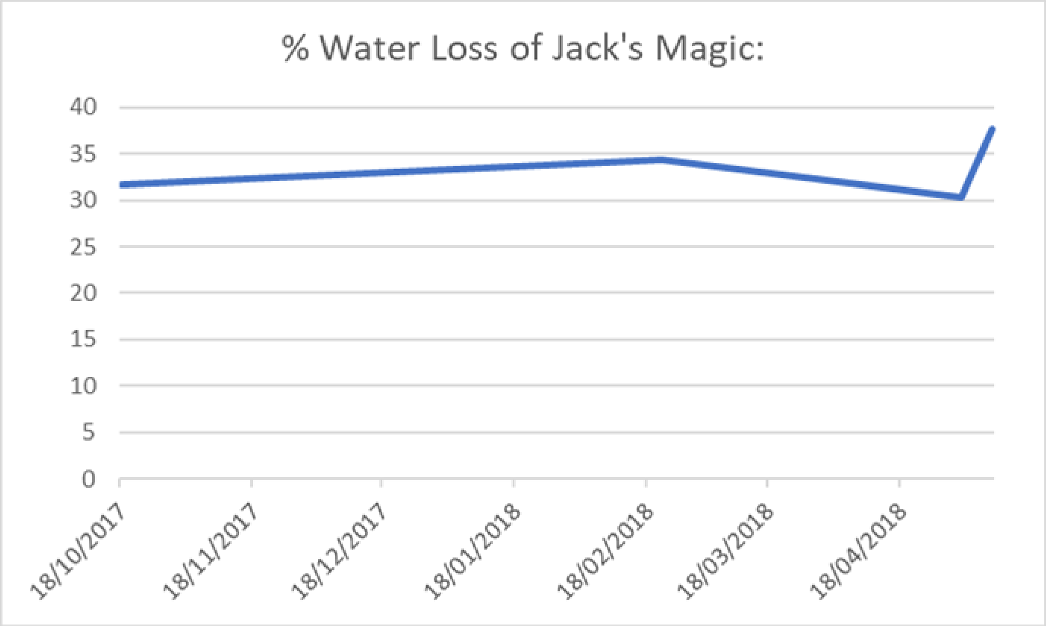
Percentage change of each peat sample:

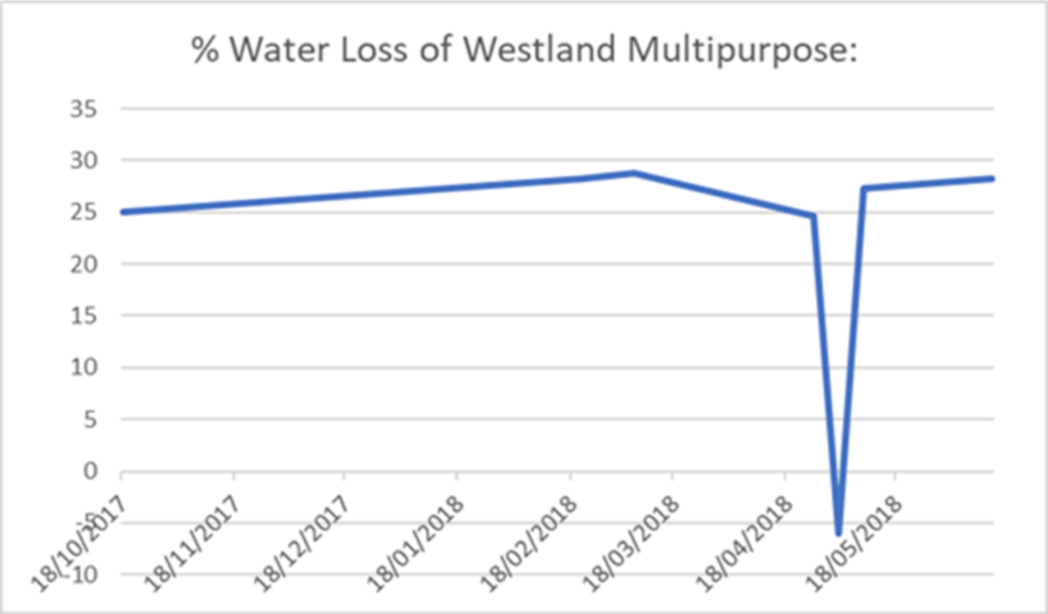
- We can infer a lot from the set of results that we have obtained.
- Firstly, we can see that the % change in water loss of peats with similar textures follow a particular pattern.
- Peats that are inconsistent and are rough in texture have shown fluctuation in % change of water loss.
- In contrast to this, peats that are consistent and are smooth in texture have shown a general steady increase in % change of water loss throughout the year.


% Water Loss of Irish Peat:
25
20
15
10
5
0
18/10/2017
18/11/2017
18/12/2017
18/01/2018
18/02/2018
18/03/2018
18/04/2018
18/05/2018


% Water Loss of Citrus Compost:
24
23
22
21
20
19
18
21/02/2018
21/03/2018
21/04/2018
21/05/2018


% Water Loss of John Innes No.3:
16
15.5
15
14.5
14
13.5
13
12.5
12
18/10/2017
18/11/2017
18/12/2017
18/01/2018
18/02/2018
18/03/2018
18/04/2018
18/05/2018


% Water Loss of Jack's Magic:
40
35
30
25
20
15
10
5
0
18/10/2017
18/11/2017
18/12/2017
18/01/2018
18/02/2018
18/03/2018
18/04/2018



- Human error in recording of the sample's mass caused a outlier in the data.
- This sample is quite consistent. As a result there isn't much fluctuation.

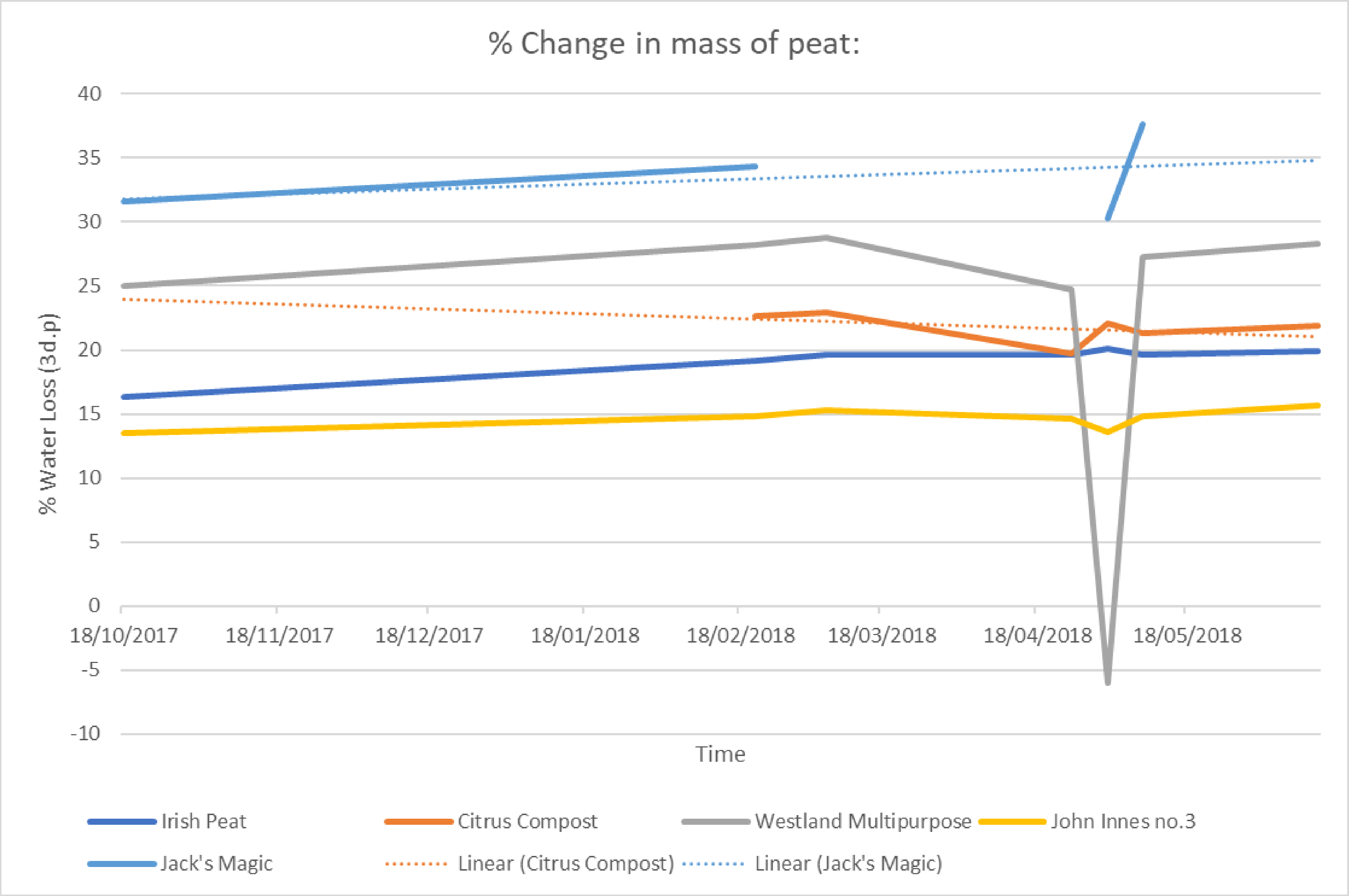
What does this tell us?

- The graphs show us that consistent peats steadily increase in % water loss.

  This could be due to the consistent greater surface area of the peat.
- However, inconsistent peats have small and big pieces of peat. Big pieces lead to less surface area and a slower rate of diffusion.

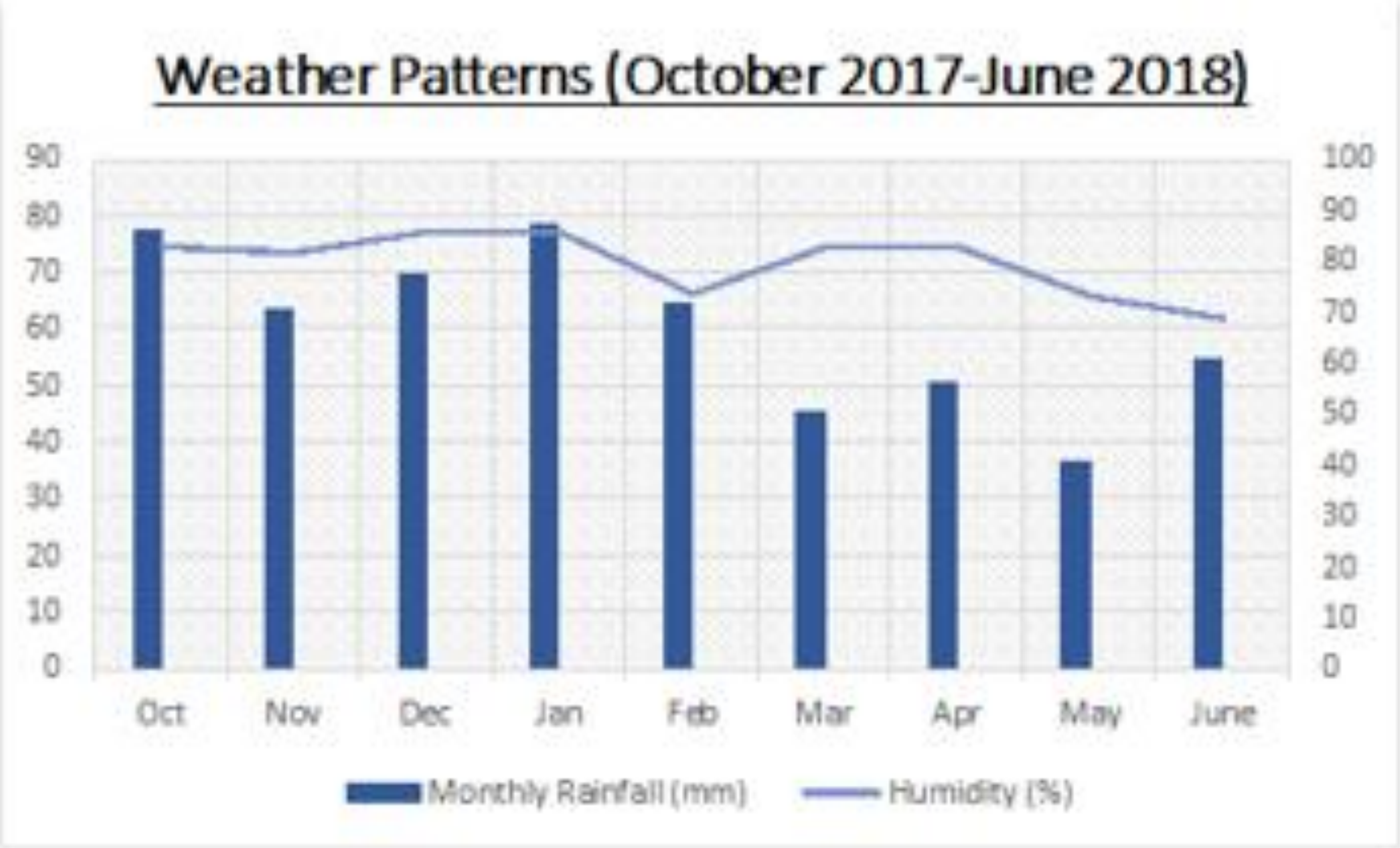
- Furthermore, all peat samples have shown slight fluctuation in % water loss during the spring when it was more humid.

This suggests that weather has a direct affect on % water loss so we should also consider this when looking at peat samples. In the spring/ summer the peat samples could provide a greater risk due to unpredictability than opposed to winter/ autumn.

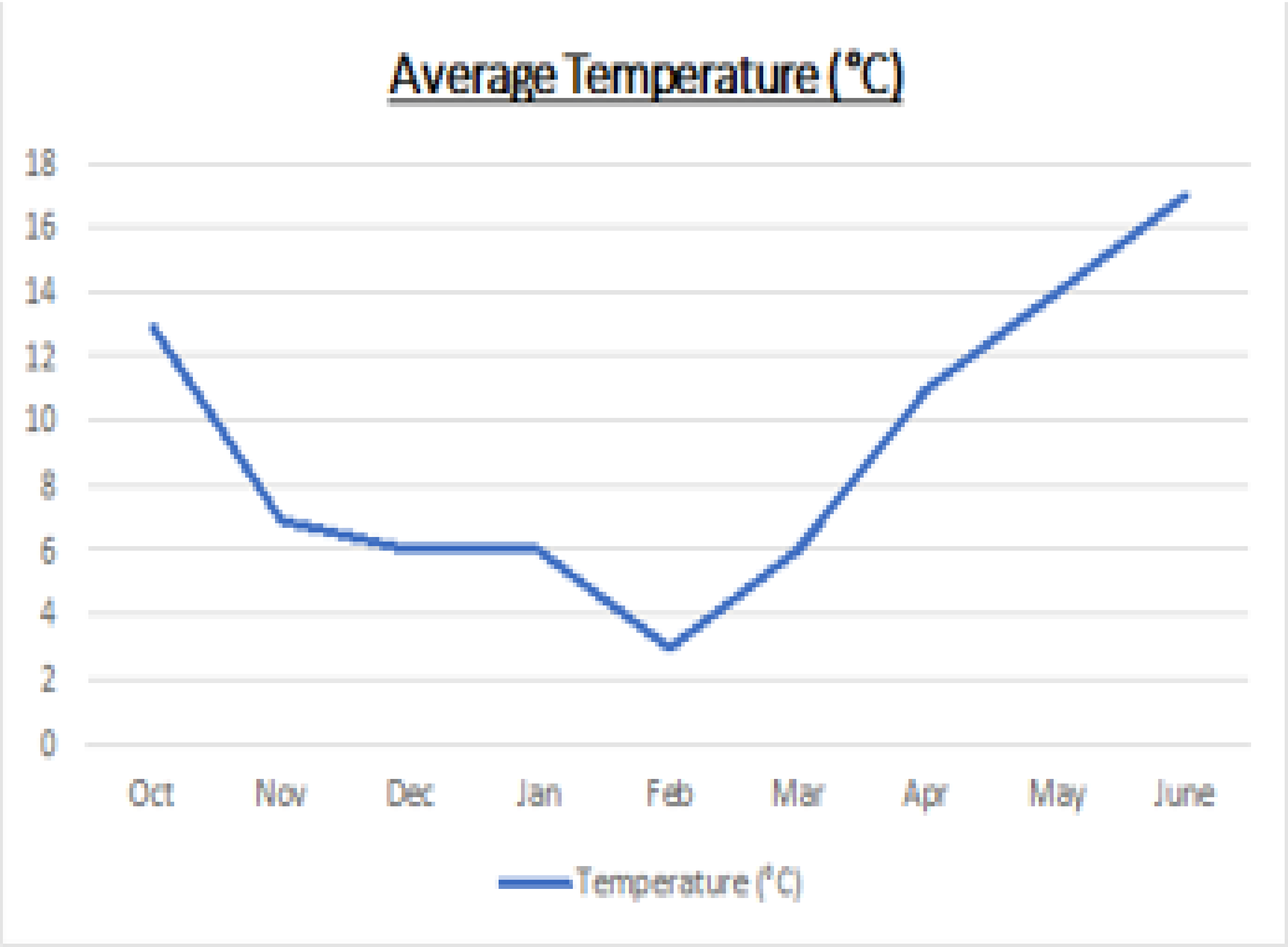


% Change in mass of peat:
40
35
30
25
20
15
10
5
0
-5
-10
% Water Loss (3d.p)
18/10/2017
18/11/2017
18/12/2017
18/01/2018
18/02/2018
18/03/2018
18/04/2018
18/05/2018
Time
Irish Peat
Citrus Compost
Westland Multipurpose
John Innes no.3
Jack's Magic
Linear (Citrus Compost)
Linear (Jack's Magic)

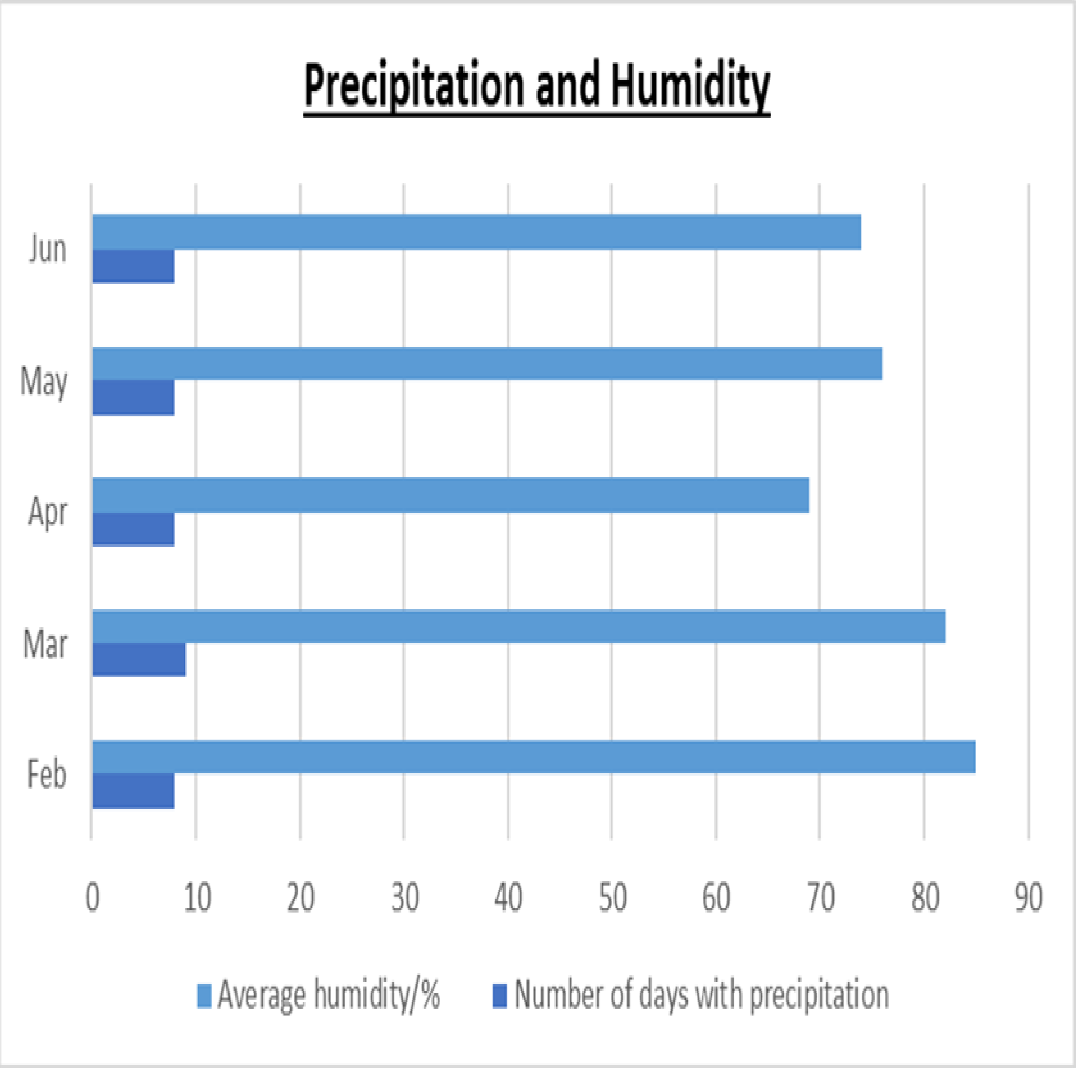
This year’s weather patterns (October 2017-June 2018)

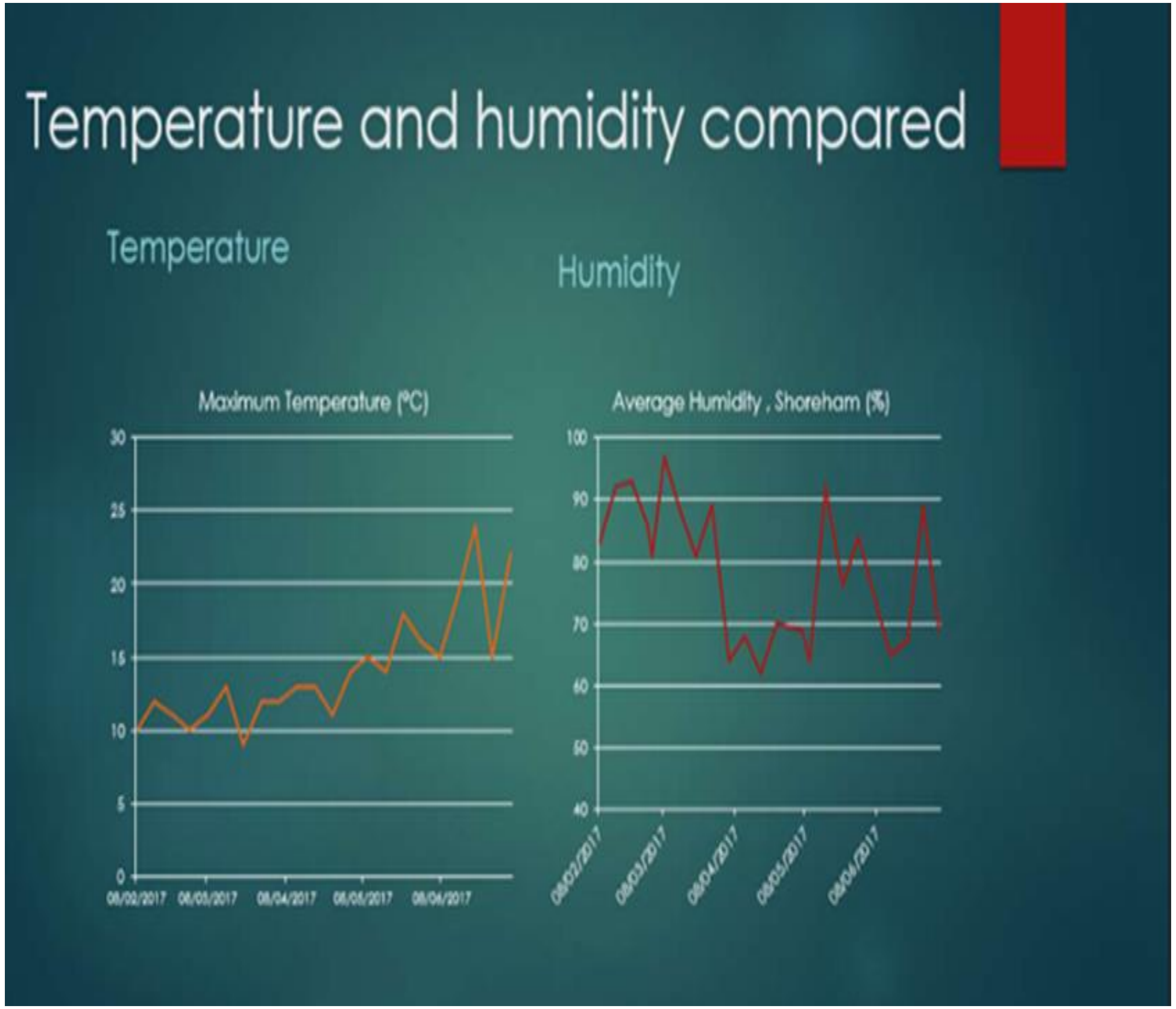


Weather Patterns (October 2017-June 2018)
90
80
70
60
50
40
30
20
10
0
100
90
80
70
60
50
40
30
20
10
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
Monthly Rainfall (mm)
Humidity (%)


Average Temperature (°C)
18
16
14
12
10
8
6
4
2
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
Temperature (°C)

Last year’s weather patterns (February 2017-June 2017)


Precipitation and Humidity
Jun
May
Apr
Mar
Feb
0
10
20
30
40
50
60
70
80
90
Average humidity/%
Number of days with precipitation


Temperature and humidity compared
Temperature
Humidity
Maximum Temperature (°C)
Average Humidity , Shoreham (%)

Limitations and the Improvements

- As the weeks progressed we found ourselves running out of our live peat samples to experiment with, and so had to use the peat from the controlled samples, which was being subjected to the same conditions as the live samples.
  Looking onward, we could have use larger samples of different peats to keep our results more reliable.
- The containers of which were holding the peat for both live and control variables were flimsy and easily breakable, sometimes causing small spillages of our peat samples and subsequently affecting our recorded masses.
  To improve this, we could use more sturdy containers.
- Our methods of trying to ignite the peat could have been different from the reality of what could have caused the fire.
  We should have used a wider range of techniques of ignition to reflect other possibilities. For example, an electrical current.
- The samples were often left out of the desiccators for longer than needed amounts of time as it was challenging to fit all the samples of the different peats into them.
  So we could have also used larger desiccator equipment.
- Being tested in a fume cupboard, there was a constant net movement of air away from the sample.
  The group could have tested the flammability of peat at different air movement conditions.

- When taking out our live samples from the desiccator equipment, we were exposing our samples to different atmospheric environments to that of inside the desiccator. This could have thus slightly in/decreased the water content of the live sample that we were testing and changing its flammability.
  As a result we could have used greater specialised equipment which would allow us to maintain a constant testing environment.
- We could've also heated and dried the peat; so would be more reflective of the possible true conditions of when the peat ignited in the flower pot because soil tends to hold onto the heat from during the day. To do this, we could have used a heat lamp.
- Was there any dead plant matter in the plant pot which could have helped chemically fuel the fire/smoldering caused by any of our ignition methods?
  We could have added different types of plant matter to our samples in repeated tests to hopefully gather more patterns and results.
- There was no way of finding out what composite of the peat increased the risk of smoldering.

With each of the peats used, we could have measured their compositions and so related that to the flammability of the peats and possibly find a key composite that largely increases the chance of ignition and to suggest a reason for this.

SUMMARY OF RESULTS

- Similar results were yielded on both attempts at the experiment.
- The 2 peat samples Citrus Compost and Westland Multipurpose began to smoulder when lit after a couple of months in both experiments but in experiment 2 another sample smouldered.
- During the first experiment this took roughly 5 months for the Citrus Compost.
- Westland Multipurpose took 5.5 months to smoulder in the first experiment.
- During the second experiment it took 5 months for Citrus Compost and 7 months for Westland Multipurpose.
- Irish peat began to smoulder after 7 months but only in the second experiment.
- Recorded temperatures were higher during the later stages of the second experiment.
- The average temperatures in Shoreham by sea were slightly higher in October, November and December in 2016 than in these months in 2017.
- From January onwards, the temperatures in 2018 were higher than that of 2017.

CONCLUSIONS

- Humidity is a rough indication of the saturation of air with water. As temperatures increase, humidity decreases. Temperature and humidity levels are inversely proportional.
- If the peat is more prone to taking on water (hygroscopic) then its water content is likely to fluctuate more.
- As the temperatures are higher at the beginning of 2018 compared to 2017, there is lower humidity in the air and so less water can be absorbed by the peat samples. This resulted in 3 samples beginning to smoulder in experiment 2 compared to the 2 in experiment 1.
- With higher fluctuating temperatures in 2018 compared to 2017, we found that the water content varied and decreased in random amounts.
- Some of the samples were less fine than others, with twigs and other constituents. With differing surface areas, the rates at which water was lost by diffusion differed.