

# RANCIDITY

# WHY PLANT-EX?

Established in 2010 and boasting an industry experience of more than 25 years, the Plant-Ex team have developed a portfolio of ingredients which are supplied into the food and feed industry across the globe. Individual development laboratories combined with experience of a multitude of different applications means that the organisation knows how to deliver a product that performs.

**Taste, colour and function** are critical elements in nutrition for both humans and animals. Our expertise spans the three subjects and our factories and raw material routes are well placed to give customers and their animals the best options that nature can offer.

<b>Taste</b>	Pallatability, flavour and preference
<b>Colour</b>	Appearance, differentiation and brand value
<b>Function</b>	Nutrition, shelf life and health

\*Talk to our team about legislatively compliant options with supportive studies assured to assist in the development of great products.





# ACCELERATED RANCIDITY TESTING

We offer tailored support to our customers using accelerated rancidity testing, this helps us to identify the correct anti-oxidant solution for your product.

We do this because:

No one product is the same, additional variables such as: co ingredients, air exposure, particle distribution, viscosity, storage temperature and processing methods can impact which antioxidants are suited to your product.

We help to identify the most efficacious anti-oxidant allowing you peace of mind that your product has the best possible natural protection against rancidity.

[WWW.PLANT-EX.COM](http://WWW.PLANT-EX.COM)  
VISIT OUR WEBSITE TO GET MORE INFORMATION



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## EXAMPLE METHOD / CASE STUDY

The customer is looking to improve their sunflower oil's antioxidant capacity that they are putting into a savoury snack product.

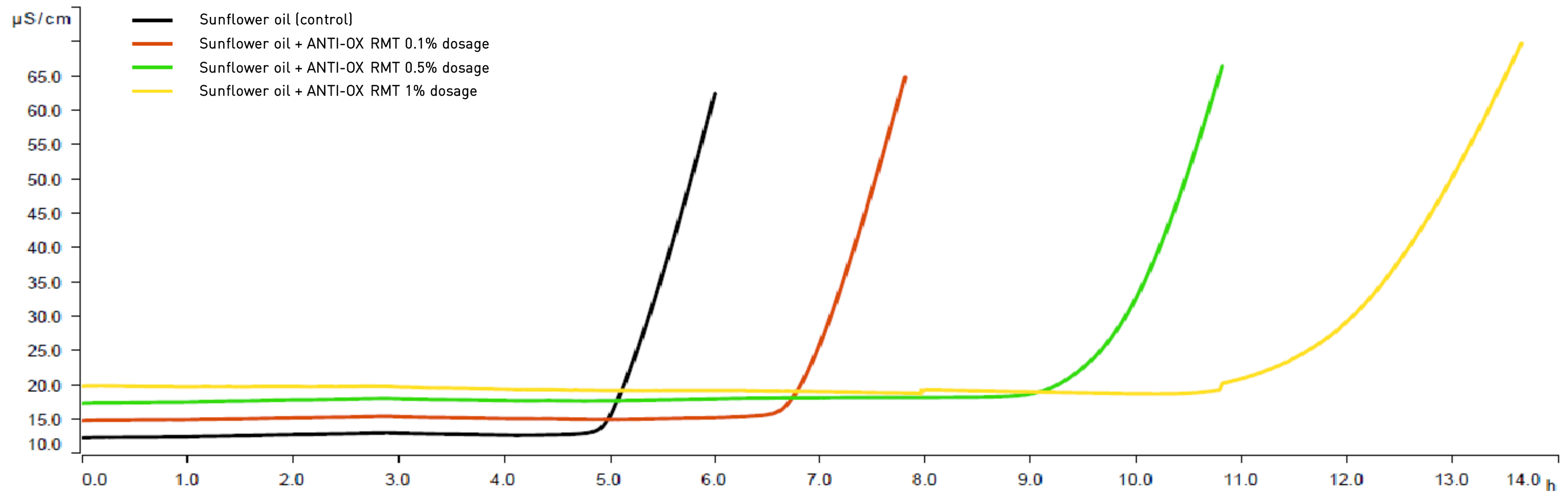
Plant-Ex request a sample of the sunflower oil.

- 1) Testing of the sunflower oil begins by testing the oil alone with accelerated rancidity testing. This is used as a baseline or control to compare against the product with added antioxidants. The control sample is tested at different temperatures, and this allows the software to give an estimated shelf life.
- 2) Antioxidants are then dosed into the product at different doses, and accelerated testing is performed again at the same temperatures as the control. The software is then able to give an estimated shelf life for each dosed sample.
- 3) The estimated shelf-life figures are then compared, and the correct antioxidant at the correct dosage is chosen and reported to the customer.



# INITIAL TESTING FOR THE EFFICACY OF FPS019427A – ANTI-OX RMT IN A SUNFLOWER OIL BASE AT DIFFERENT DOSAGES.

\*Induction times show the time taken until the uptake of oxidation products are detected. They do not represent real-time; however, they do give an indication as to the efficacy of the products antioxidant capacity.



DATE	NUMBER	IDENT	METHOD	SAMPLE TEMPERATURE ( °C)	INDUCTION TIME (h)	STABILITY TIME (h)	LEGEND	DISPLAY
2021-01-15 09:39:36 UTC+0	1	Sunflower Oil	Sunflower oil test	110.0	4.97	6.00	—	On
2021-01-15 09:39:38 UTC+0	2	Anti-OX RMT S1	Sunflower oil test	110.0	6.73	7.81	—	On
2021-01-15 09:39:40 UTC+0	3	Anti-OX RMT S2	Sunflower oil test	110.0	9.88	10.83	—	On
2021-01-15 09:39:42 UTC+0	4	Anti-OX RMT S3	Sunflower oil test	110.0	10.60	13.66	—	On

# EXTRAPOLATION OF DATA TAKEN FROM ACCELERATED RANCIDITY TESTING OF SUNFLOWER OIL WITH NO ADDED ANTIOXIDANTS HAS AN ESTIMATED SHELF LIFE OF 2.03 YEARS AT ROOM TEMPERATURE.

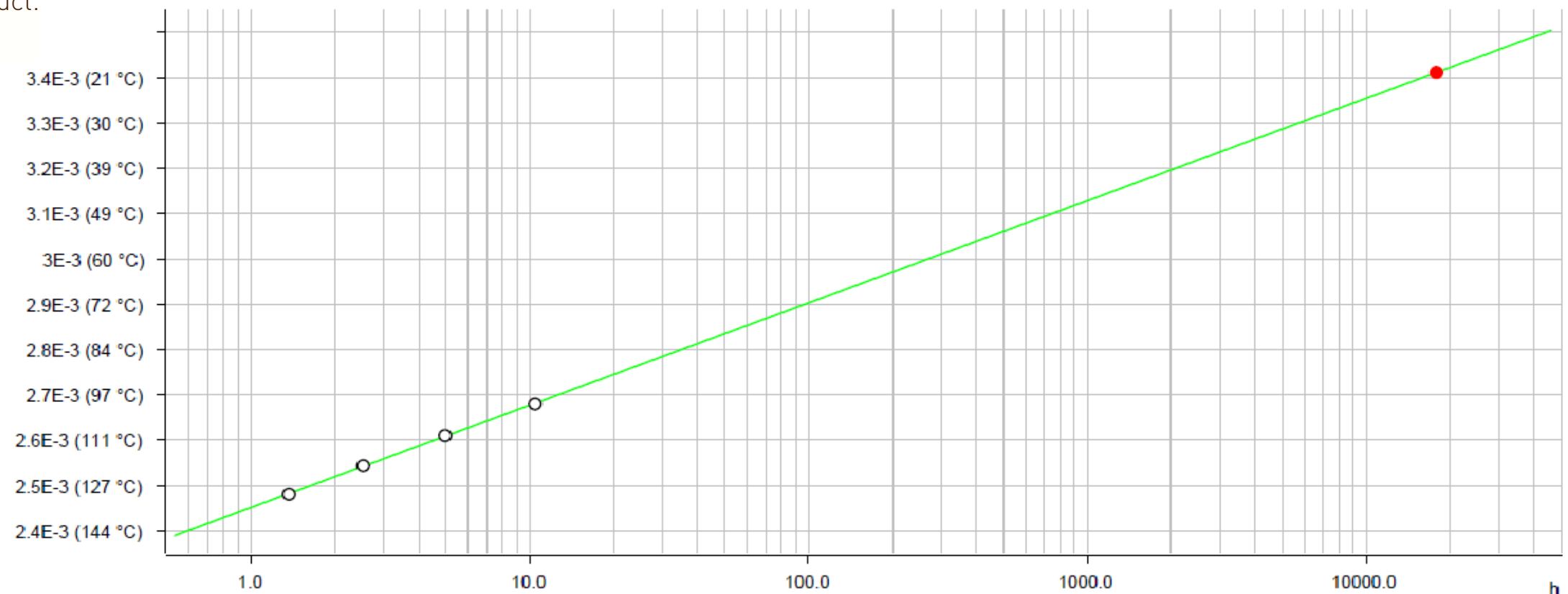
This is calculated by running the accelerated testing at different temperatures. The software uses a formula to give a rough estimate of how the sample will perform at the desired temperature; in this instance, 20°C was selected as this is recognised as standard room temperature. The more temperatures that are recorded, the more accurate the estimate will be. However, it is only an estimate and is in no way giving an exact shelf life. Before results can be analysed the control data shown below must be calculated to give a baseline estimate of the product's shelf life without an antioxidant product.

### Extrapolation parameters

**Calculation type:** Arrhenius  
**Formula:**  $t = A \times \exp(B \times 1/T)$   
**Results used:** Induction time  
**Target temperature:** 20.0 °C

### Regression coefficients

**A:** 1.39E-11  
**R<sup>2</sup>:** 0.99961  
**B:** (Arrhenius coefficient)  
10197.8  
**Number of determinations:** 4  
**Extrapolation**  
**Estimated time:** 2.03 years  
**Target temperature:** 20.0 °C



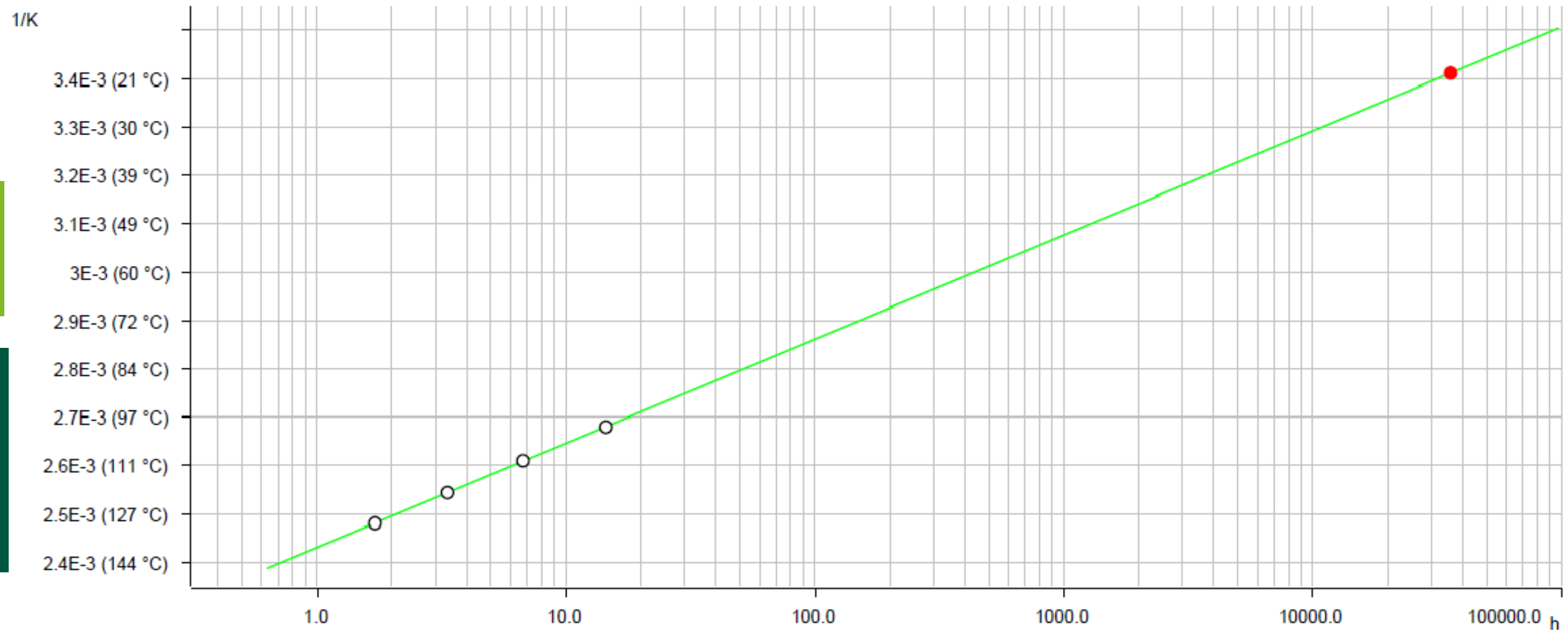
DETERMINATION START	IDENT	METHOD NAME	SAMPLE TEMPERATURE ( °C)	TEMPERATURE CORRECTION ( °C)	INDUCTION TIME (h)	USED
1 2021-01-15 09:39:36 UTC+0	Sunflower Oil	Sunflower oil test	110.0	1.5	4.97	On
2 2021-01-18 11:32:11 UTC+0	Sunflower Oil	Sunflower test 130	130.0	1.7	1.37	On
3 2021-01-18 11:32:28 UTC+0	Sunflower Oil	Sunflower test 120	120.0	1.6	2.53	On
4 2021-01-19 09:08:06 UTC+0	Sunflower Oil	Sunflower test 100	100.0	1.4	10.45	On

# EXTRAPOLATION OF DATA TAKEN FROM ACCELERATED RANCIDITY TESTING OF SUNFLOWER OIL WITH **FPS019427A** - ANTI-OX RMT DOSED AT 0.1%.

The data and calculations suggest that adding this product at this dosage will prevent rancidity and increase the shelf life of the sunflower oil to 4.08 years, doubling the inhibition of products that are produced during rancidity.

**Extrapolation parameters**  
**Calculation type:** Arrhenius  
**Formula:**  $t = A \times \exp(B \times 1/T)$   
**Results used:** Induction time  
**Target temperature:** 20.0 °C

**Regression coefficients**  
**A:** 5.15E-12  
**R<sup>2</sup>:** 0.99992  
**B:** (Arrhenius coefficient)  
 10693.4  
**Number of determinations:** 4  
**Extrapolation**  
**Estimated time:** 4.08 years  
**Target temperature:** 20.0 °C



DETERMINATION START	IDENT	METHOD NAME	SAMPLE TEMPERATURE ( °C)	TEMPERATURE CORRECTION ( °C)	INDUCTION TIME (h)	USED
1 2021-01-15 09:39:38 UTC+0	Anti-OX RMT S1	Sunflower oil test	110.0	1.5	6.73	On
2 2021-01-18 11:32:15 UTC+0	Anti-OX RMT S1	Sunflower test 130	130.0	1.7	1.71	On
3 2021-01-18 11:32:30 UTC+0	Anti-OX RMT S1	Sunflower test 120	120.0	1.6	3.35	On
4 2021-01-19 09:08:08 UTC+0	Anti-OX RMT S1	Sunflower test 100	100.0	1.4	14.48	On

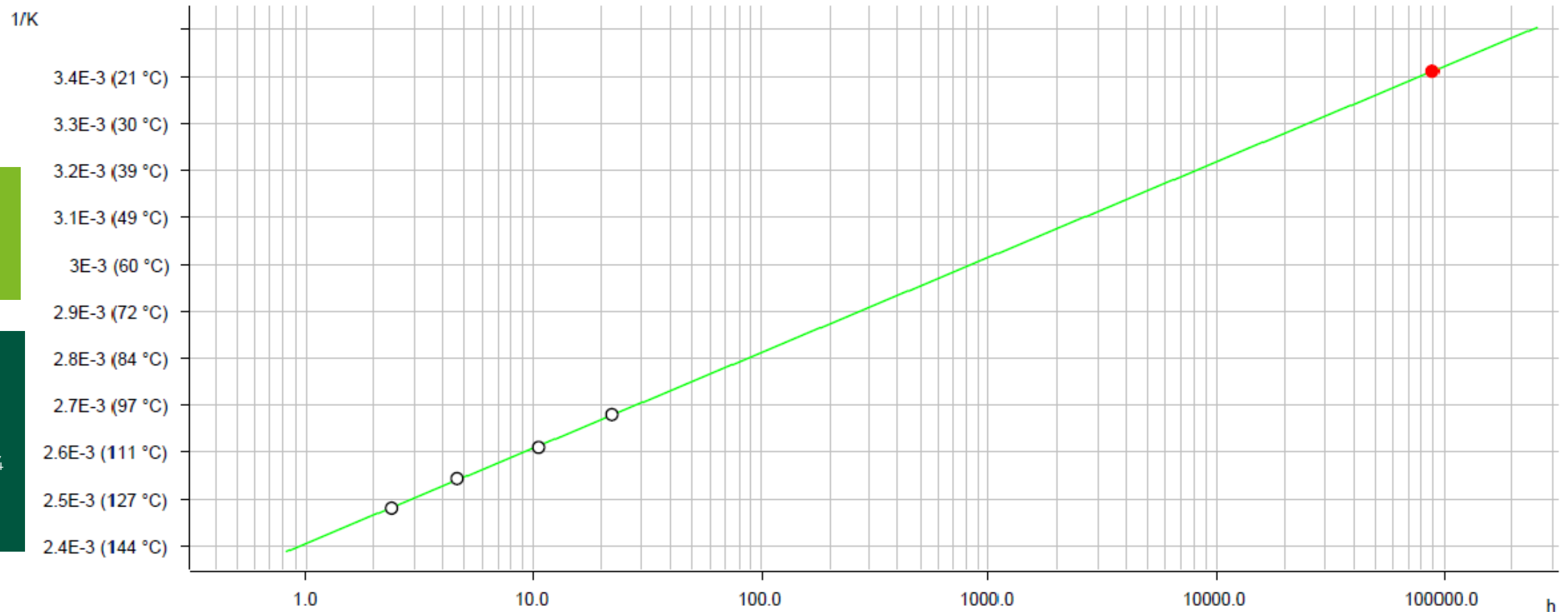


# EXTRAPOLATION OF DATA TAKEN FROM ACCELERATED RANCIDITY TESTING OF SUNFLOWER OIL WITH **FPS019427A - ANTI-OX RMT DOSED AT 1%.**

The data and calculations suggest that adding this product at this dosage will prevent rancidity and increase the shelf life of the sunflower oil to 10.01 years, and this is why we say that the shelf life is an estimate. It will allow us to identify how effective the antioxidant will be but not quantify specific shelf-life data.

**Extrapolation parameters**  
**Calculation type:** Arrhenius  
**Formula:**  $t = A \times \exp(B \times 1/T)$   
**Results used:** Induction time  
**Target temperature:** 20.0 °C

**Regression coefficients**  
**A:** 1.48E-12  
**R<sup>2</sup>:** 0.99898  
**B:** (Arrhenius coefficient) 11326.7  
**Number of determinations:** 4  
**Extrapolation**  
**Estimated time:** 10.01 years  
**Target temperature:** 20.0 °C



DETERMINATION START	IDENT	METHOD NAME	SAMPLE TEMPERATURE ( °C)	TEMPERATURE CORRECTION ( °C)	INDUCTION TIME (h)	USED
1 2021-01-15 09:39:42 UTC+0	Anti-OX RMT S3	Sunflower oil test	110.0	1.5	10.60	On
2 2021-01-18 11:32:25 UTC+0	Anti-OX RMT S3	Sunflower test 130	130.0	1.7	2.73	On
3 2021-01-18 11:32:36 UTC+0	Anti-OX RMT S3	Sunflower test 120	120.0	1.6	4.65	On
4 2021-01-19 09:08:13 UTC+0	Anti-OX RMT S3	Sunflower test 100	100.0	1.4	22.19	On

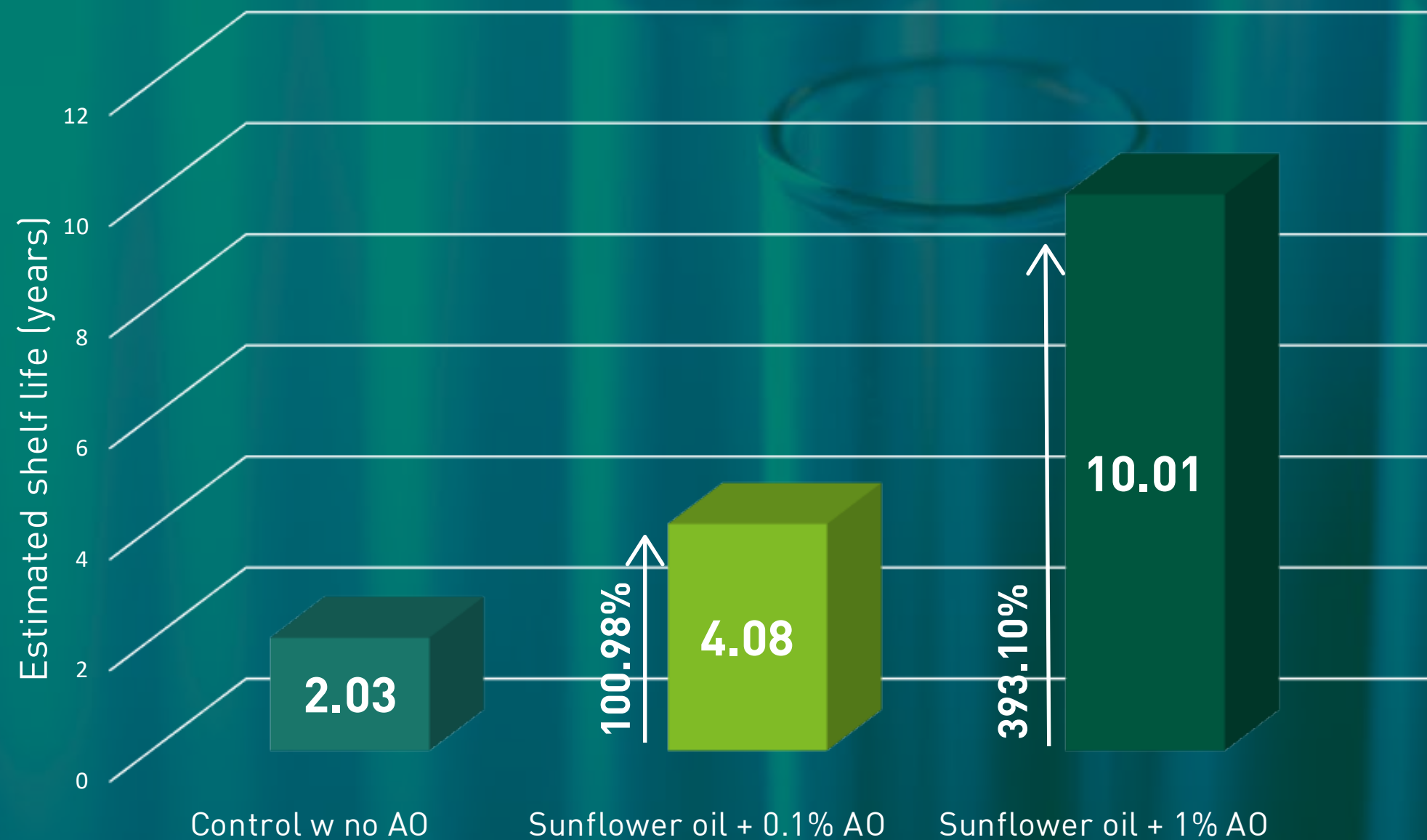


# RESULTS ANALYSIS

The results give us an estimated percentage increase for the efficacy of the product when using the ANTI-OX RMT product in sunflower oil.

When using the antioxidant at 0.1%, the product efficacy increases by up to 100.98%.

When using the antioxidant at 1%, efficacy increases by up to 393.10%.

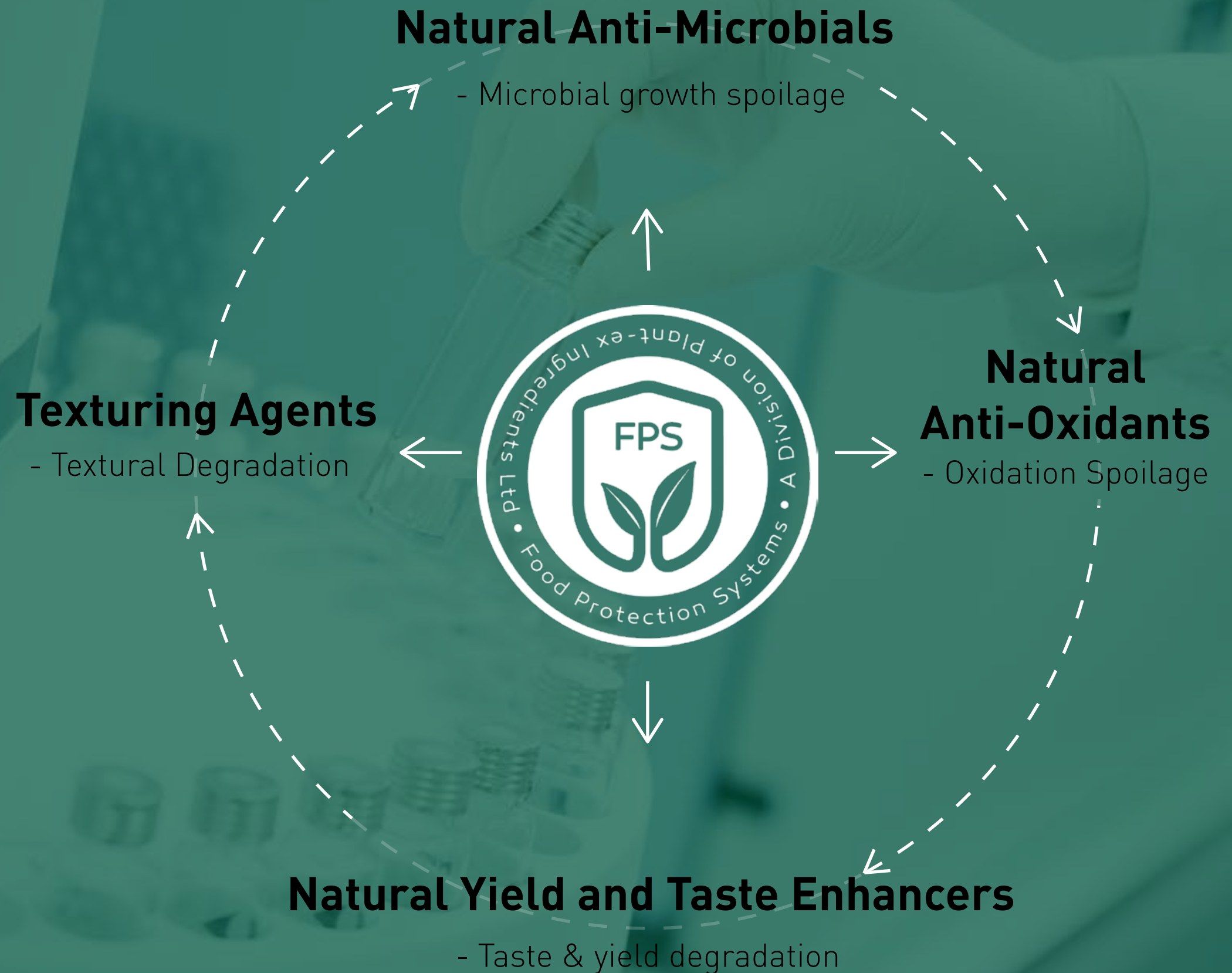


# CONCLUSION

The initial testing of **ANTI-OX RMT** in **sunflower oil** showed that dosages between **0.1% - 1%** might sufficiently inhibit rancidity.

This information was communicated to the customer, who could then place an order for **FPS019427A – ANTI-OX RMT**. They were advised to dose at **0.5%** and work up or down depending on their needs.

\*All results, including shelf-life estimates, are independent of their application and only indicate the efficacy of an antioxidant product in the specific application. Plant-Ex Ltd will then use this information to provide technical support to a customer for how they may proceed.





# SUMMARY

**The benefits of using natural antioxidants and accelerated rancidity testing:**

**Reducing food waste** - providing natural antioxidant solutions that keep products fresher for longer.

**Peace of mind** - full technical support provided, giving you expert advice.

**Ensuring functionality** – using our method, we ensure the full functionality of our antioxidant in your product.

**Targeting efficacy** – we successfully target the correct dosage to maintain maximum efficacy.

**Optimised dosages**- ensuring maximum cost in use benefit.







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