PGRO Final Levy Report

EIP-Biostimulant trials 2021

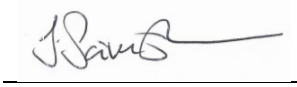
Project title	EIP-Biostimulant trials 2021
Sponsor project reference	
Test items	Various
Country / Region / EPPO zone	United Kingdom EPPO Maritime zone
Target crop	Vining peas, combining peas, spring beans
Target pest	
Report author	Tom Jelden, Jim Scrimshaw
Date issued	October 2021
Trial year	2021
Trials by	PGRO Research Ltd Great North Road Thornhaugh Cambridgeshire PE8 6HJ United Kingdom
Sponsor	n/a

Chapters

List of tables

Declarations

We the undersigned hereby declare that the report submitted constitutes the Final Report of the study above and that all data reported here represent a true and accurate record of the results obtained. Every reasonable effort was made to ensure that disease, insect, weed pressures and crop husbandry were as relevant to the trial aims as possible.



Jim Scrimshaw
PGRO Principal Technical Officer

Objectives

To determine,

- The effects of selected biostimulant products on arable legume development.

Summary / Conclusions

- Foliar disease and foot rot in beans was affected by some biostimulant products.
- Yield and vigour were not significantly affected by any of the biostimulant products tested.
- Products Take-off ST and Phorce demonstrated the greatest positive effects on crop development.

Test items and treatments

Table 1. Treatment list

Trt	Description	Rate(s)	Timing
1	Untreated	n/a	n/a
2	TFP Pro Soil	1 l/ha	T0
3	Serenade ASO	8 l/ha	T0
4	Radiate	2 l/ton	T0
5	Start-uP	2 l/ton	T0
6	Take Off ST	1 l/ton	T0
7	Multimax GPA	200 ml/ton	T0
8	KickOff	4 l/ton	T0
9	TFP Pro-Tect	1 l/ha	T1 + T2
10	Zynergy + NA13	1 l/ha + 0.1% vol	T1 + T2
11	Agrihit Foliar Tonic	0.67 l/ha	T1 + T2
12	Phorce	1 l/ha	T1 + T2
13	Prestop	1.5 kg/ha	T0 + T1

Table 2. Description of application timings

Timing	Growth stage or description of timing	BBCH
T0	Applied to seed or soil prior to drilling	00
T1	2nd node (treatment 12)	12
	4th node (treatment 9)	14
	Early flower (treatment 10, 11, 13)	51-60
T2	Buds present (treatment 12)	51
	10-14 days after application (treatment 10, 11)	
	21 days after application (treatment 9)	

Methods

Trial design – Plots measured 20 m² (2x10 m) and were arranged in a randomised complete block layout with four replications.

Sprayer details - Treatments were applied using an AZO hand operated compressed air boom sprayer with a width of two metres. Lurmark 02F110 nozzles were used, operating at a pressure of 2 bar for a fine/medium droplet quality. Spray volumes were 200 l/ha, with the exception of treatment 13 that was applied at 300 l/ha.

Assessments - Downy mildew (*Peronospora viciae*) and rust (*Uromyces viciae-fabae*) were assessed in spring beans as percentage leaf area infection on 25 plants per plot (based on EPPO guidelines PP1/172 (2), PP1/121 (2), PP1/124(2) and PP1/054 (3)). In spring beans, nodulation was assessed as a score of 0 to 5 with 0 = no nodules, 5 = excellent nodulation on 15 randomly selected plants per plot. The number of nodules was also recorded. Foot rot was assessed in vining peas and spring beans on a 0 to 5 scale with 0 = no foot rot, 5 = dead root on 25 randomly selected plants per plot.

Harvest – Combining peas and spring beans were harvested using a Wintersteiger nurserymaster plot combine. All results transformed and reported at 15% moisture. Vining peas were harvested by hand and threshed in a static viner.

Analysis – SAS statistical software was used to perform statistical analyses of all data. Foliar disease data were analysed using pseudo-binomial logistic regression as described by McCullagh and Nelder, 1989. Yield data were analysed using standard ANOVA methods. Foot rot and nodulation scores were analysed using Kruskal-Wallis non-parametric analysis.

Table 3. Trial diary

Activity	Vining pea	Combining pea	Spring bean
Drill	23/03/21	25/03/21	23/03/21
T0 (soil applications)	31/03/21	31/03/21	31/03/21
T1	07/05/21 (12), 18/05/21 (9), 04/06/21 (13, 10, 11)	12/05/21 (12), 18/05/21 (9), 04/06/21 (13, 10, 11)	12/05/21 (12), 18/05/21 (9), 04/06/21 (13, 10, 11)
T2	01/06/21 (12), 04/06/21 (9), 15/06/21 (10, 11)	01/06/21 (12), 04/06/21 (9), 15/06/21 (10, 11)	01/06/21 (12), 04/06/21 (9), 15/06/21 (10, 11)
Assessments			
Emergence	27/04/21	10/05/21	10/05/21
Foot rot	29/06/21	n/a	09/07/21
Nodulation	n/a	n/a	09/07/21
Foliar disease	29/06/21	n/a	20/07/21
Harvest	25/06/21	13/08/21	03/09/21

Trial site

Table 4. Site details for Stubton.

	Test site information
Town	Stubton
Postcode	NG23 5DA
N	53°1'58.23"
W	0°40'42.92"
Soil analysis	pH = 7.6, P/K/Mg mg/l = 12.4/107/82, Sandy loam
Site description	A cloddy, medium sandy loam plot placed amongst numerous other trials. Slow and unevenly emerging crop.
Crop	Vining pea, Combining pea, Spring bean
Variety	Tomahawk, Prophet, Fuego
Drill date	23/03/21, 25/03/21, 23/03/21
Inputs	Pre em; Nirvana 4 l/ha, Centium 360 CS 0.25 l/ha Fungicide; Amistar 0.75 l/ha (SB), Microthiol special 8 kg/ha (CP)

Results

Vining peas

Vining peas established well. There was no significant treatment effect on crop establishment. A second vining pea trial was established on Holbeach Marsh but was destroyed by suspected damping off.

Table 5. Mean vining pea crop density (plants/m^2).

		Crop density
1	Untreated	110.2
2	TFP Pro Soil	88.4
3	Serenade ASO	94.7
4	Radiate	104.4
5	Start-uP	94.2
6	Take Off ST	104.9
7	Multimax GPA	101.8
8	KickOff	92.9
9	TFP Pro-Tect	91.1
10	Zynergy + NA13	93.3
11	Agrihit Foliar Tonic	92.4
12	Phorce	91.6
13	Prestop	96.4
	F statistic	0.98
	p-value	0.51

A low amount of downy mildew developed in the trial. There was no significant treatment effect on downy infection.

Table 6. Mean leaf area infection (LAI) with downy mildew.

		% LAI
1	Untreated	0.57
2	TFP Pro Soil	0.88
3	Serenade ASO	0.72
4	Radiate	0.53
5	Start-uP	0.73
6	Take Off ST	0.52
7	Multimax GPA	0.52
8	KickOff	0.37
9	TFP Pro-Tect	0.97
10	Zynergy + NA13	0.83
11	Agrihit Foliar Tonic	0.63
12	Phorce	0.75
13	Prestop	0.55
	Wald χ^2	7.43
	p-value	0.83

A high pressure of *Aphanomyces euteiches*, a pea foot rot pathogen, was present in the trial area leading to high levels of root infection. The crop withstood the infection rather well considering the severity, likely due to ample rainfall in early summer and lack of hot dry periods in June. The crop did, however, accelerate to maturity very rapidly despite the lack of heat. Treatment 13 showed significantly less foot rot infection compared to treatment 9, but no other treatment effects were observed.

Table 7. Mean foot rot severity score.

		Score
1	Untreated	4.30_{ab}
2	TFP Pro Soil	4.05_{ab}
3	Serenade ASO	4.33_{ab}
4	Radiate	4.27_{ab}
5	Start-uP	4.12_{ab}
6	Take Off ST	4.12_{ab}
7	Multimax GPA	4.23_{ab}
8	KickOff	4.18_{ab}
9	TFP Pro-Tect	4.38_{a}
10	Zynergy + NA13	4.32_{ab}
11	Agrihit Foliar Tonic	3.98_{ab}
12	Phorce	4.02_{ab}
13	Prestop	3.92_{b}
	Kruskal-Wallis χ^2	31.7
	p-value	0.002

There were no treatment effects on fresh haulm biomass.

Table 8. Mean haulm mass (t/ha).

		Haulm
1	Untreated	13.6
2	TFP Pro Soil	14.3
3	Serenade ASO	15.1
4	Radiate	13.9
5	Start-uP	13.7
6	Take Off ST	16.7
7	Multimax GPA	14.0
8	KickOff	14.3
9	TFP Pro-Tect	13.4
10	Zynergy + NA13	13.7
11	Agrihit Foliar Tonic	14.7
12	Phorce	15.0
13	Prestop	14.2
	F statistic	0.71
	p-value	0.72

The trial yielded modestly, but better than expected considering the severity of foot rot. There were no significant treatment effects on yield.

Table 9. Mean yield (t/ha).

		Yield
1	Untreated	3.58
2	TFP Pro Soil	3.52
3	Serenade ASO	3.61
4	Radiate	3.68
5	Start-uP	3.61
6	Take Off ST	4.06
7	Multimax GPA	3.57
8	KickOff	3.57
9	TFP Pro-Tect	3.35
10	Zynergy + NA13	3.79
11	Agrihit Foliar Tonic	3.45
12	Phorce	3.89
13	Prestop	3.50
	F statistic	0.67
	p-value	0.75

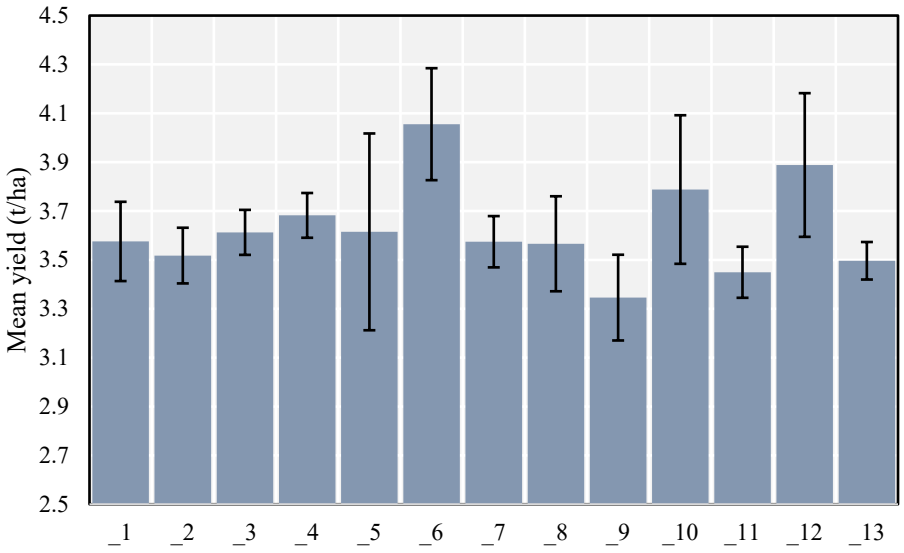


Figure 1. Mean vining pea yield (t/ha).

Combining peas

Combining pea crop density was much lower than originally targeted. Emergence was slow and uneven due to the prolonged dry spell following drilling and the suspected low vigour of seed that was used. The figures in table 10 are likely to be lower than what actually emerged as new plants were emerging long after the assessment was made. There was no treatment effect on emergence.

Table 10. Mean combining pea crop density (plants/m^2).

		Crop density
1	Untreated	44.0
2	TFP Pro Soil	40.4
3	Serenade ASO	50.0
4	Radiate	49.8
5	Start-uP	42.2
6	Take Off ST	35.1
7	Multimax GPA	44.9
8	KickOff	47.6
9	TFP Pro-Tect	52.4
10	Zynergy + NA13	39.6
11	Agrihit Foliar Tonic	28.0
12	Phorce	51.1
13	Prestop	43.1
	F statistic	1.34
	p-value	0.24

There was no treatment effect on yield.

Table 11. Mean yield (t/ha).

		Yield
1	Untreated	3.34
2	TFP Pro Soil	3.52
3	Serenade ASO	3.57
4	Radiate	3.32
5	Start-uP	3.47
6	Take Off ST	3.95
7	Multimax GPA	4.35
8	KickOff	3.85
9	TFP Pro-Tect	3.88
10	Zynergy + NA13	3.55
11	Agrihit Foliar Tonic	3.48
12	Phorce	3.53
13	Prestop	3.56
	F statistic	1.81
	p-value	0.08

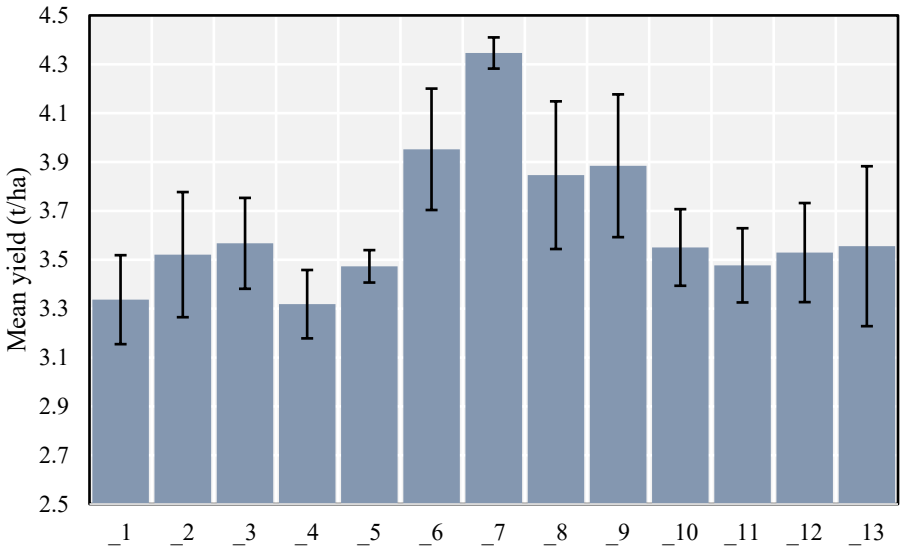


Figure 2. Mean combining pea yield (t/ha).

Spring beans

Spring bean crop density was much lower than originally targeted. Emergence was slow and uneven due to the prolonged dry spell following drilling and the suspected low vigour of seed that was used. The fourth replicate was not harvested due to inconsistent emergence. There was no treatment effect on emergence.

Table 12. Mean spring bean crop density (plants/m^2).

		Crop density
1	Untreated	32.9
2	TFP Pro Soil	32.0
3	Serenade ASO	22.2
4	Radiate	34.7
5	Start-uP	23.1
6	Take Off ST	33.3
7	Multimax GPA	31.6
8	KickOff	24.4
9	TFP Pro-Tect	23.6
10	Zynergy + NA13	20.4
11	Agrihit Foliar Tonic	29.8
12	Phorce	23.1
13	Prestop	23.6
	F statistic	0.37
	p-value	0.97

Downy mildew infection was low in the trial. There were no statistically significant treatment effects on downy mildew. However, the reduction in downy mildew observed in treatment 12 should be noted as it is a 37% reduction in infection compared to the untreated.

Table 13. Mean leaf area infection (LAI) with downy mildew.

		% LAI
1	Untreated	1.72
2	TFP Pro Soil	1.63
3	Serenade ASO	1.71
4	Radiate	1.63
5	Start-uP	1.37
6	Take Off ST	1.48
7	Multimax GPA	1.45
8	KickOff	1.60
9	TFP Pro-Tect	1.43
10	Zynergy + NA13	1.47
11	Agrihit Foliar Tonic	1.45
12	Phorce	1.09
13	Prestop	1.51
	F statistic	7.9
	p-value	0.79

There were moderate amounts of bean rust in the trial area. Significant treatment effects were observed. Treatments 6 + 7 performed best compared to treatments 1, 5 + 11 which were relatively poor performing. It is unlikely that any of the treatments had any direct effect on the pathogen, rather that effects were probably conferred by indirect effects on vigour / nutrition.

Table 14. Mean leaf area infection (LAI) rust.

		% LAI
1	Untreated	4.22_{abc}
2	TFP Pro Soil	3.73_{bcd}
3	Serenade ASO	3.54_{bcd}
4	Radiate	3.87_{bcd}
5	Start-uP	5.2_{ab}
6	Take Off ST	2.62_{cd}
7	Multimax GPA	2.01_{d}
8	KickOff	5.57_{ab}
9	TFP Pro-Tect	3.76_{bcd}
10	Zynergy + NA13	3.51_{bcd}
11	Agrihit Foliar Tonic	6.61_{a}
12	Phorce	3.61_{bcd}
13	Prestop	3.31_{bcd}
	F statistic	82.0
	p-value	<0.001

There was a moderate level of foot rot infection in the trial. Significant treatment effects were observed. Treatments 3 and 6 had significantly lower levels of foot rot compared to treatments 1 and 2. It is possible that treatments 3 and 6 could have a direct effect on the foot rot pathogens.

Table 15. Mean foot rot severity score.

		Score
1	Untreated	2.65_{a}
2	TFP Pro Soil	2.67_{a}
3	Serenade ASO	1.95_{b}
4	Radiate	2.47_{ab}
5	Start-uP	2.13_{ab}
6	Take Off ST	1.92_{b}
7	Multimax GPA	2.33_{ab}
8	KickOff	2.50_{ab}
9	TFP Pro-Tect	2.22_{ab}
10	Zynergy + NA13	2.23_{ab}
11	Agrihit Foliar Tonic	2.43_{ab}
12	Phorce	2.45_{ab}
13	Prestop	2.35_{ab}
	Kruskal-Wallis χ^2	33.8
	p-value	<0.001

Nodulation was modest in this trial. Significant treatment effects were observed. The control showed the lowest level of nodulation, significantly lower than treatment 9. This may partially reflect foot rot severity.

Table 16. Mean nodulation score.

		Score
1	Untreated	1.58_{b}
2	TFP Pro Soil	1.85_{ab}
3	Serenade ASO	2.12_{ab}
4	Radiate	1.83_{ab}
5	Start-uP	2.03_{ab}
6	Take Off ST	2.10_{ab}
7	Multimax GPA	1.78_{ab}
8	KickOff	1.82_{ab}
9	TFP Pro-Tect	2.27_{a}
10	Zynergy + NA13	2.03_{ab}
11	Agrihit Foliar Tonic	2.00_{ab}
12	Phorce	1.83_{ab}
13	Prestop	1.85_{ab}
	Kruskal-Wallis χ^2	26.0
	p-value	0.01

There were no significant treatment effects on yield.

Table 17. Mean yield (t/ha).

		Yield
1	Untreated	3.74
2	TFP Pro Soil	3.88
3	Serenade ASO	3.72
4	Radiate	3.85
5	Start-uP	3.69
6	Take Off ST	3.76
7	Multimax GPA	3.84
8	KickOff	3.61
9	TFP Pro-Tect	3.52
10	Zynergy + NA13	3.45
11	Agrihit Foliar Tonic	3.42
12	Phorce	4.12
13	Prestop	3.85
	F statistic	0.29
	p-value	0.99

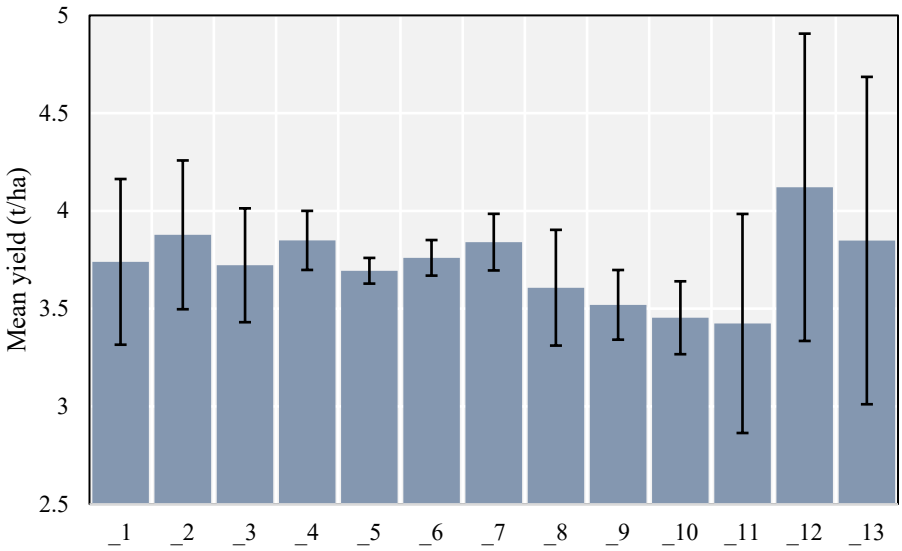


Figure 3. Mean spring bean yield (t/ha).

Discussion

These trials were conducted to assess the effects of various biostimulants on the development of combining peas, vining peas and spring beans.

There were no treatment effects on emergence. These assessments may have been affected by the slow and uneven emergence in pulses. Some biostimulants claim an effect of improving vigour which did not show here.

Foliar disease was affected by biostimulant treatments. Bean rust appeared to be decreased by the use of Multimax GPA and probably also Take-off ST. This may have been due to decreased foot rot severity or improved crop nutrition which then had an indirect effect on foliar disease. Downy mildew was also decreased (albeit not significantly) by Phorce in beans. This is an established property of Phorce. It did not, however, have any effect in vining peas.

Foot rot was affected by treatments, most notably in beans. Take-off ST and Serenade reduced infection compared to the control. This may have been due to a direct effect of those products on the foot rot pathogens, particularly in the case of Serenade (a biological product).

There were no statistically significant treatment effects on yield in any crop. However, treatments 6 and 12 (Take-off ST and Phorce) generally performed best across the board. Take-off ST showed the most positive effects in many assessments.

Certificate of

Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom

This certifies that

PGRO Research Ltd

complies with the minimum standards laid down in Regulation (EC) 1107/2009 for efficacy testing.

The above Facility/Organisation has been officially recognised as being competent to carry out efficacy trials/tests in the United Kingdom in the following categories:

Agriculture/Horticulture
Biologicals and Semiochemicals

Date of issue: 9 January 2018
Effective date: 1 January 2018
Expiry date: 31 December 2022

Signature Susan Richard
Authorised signatory

Certification Number
ORETO 384

HSE
Chemicals Regulation Division

Department of Agriculture and Rural Development

Appendix

Table 18. Daily weather data, Stubton.

	Mean °C	Max °C	Min °C	Dew Point °C	Solar radiation [W/m^2]	Mean % Humidity	Total rainfall mm	Leaf Wetness (min)
2021-07-31	16.61	20.77	13.12	16.3	164	98.88	0	655
2021-07-30	14.73	21.91	11.44	14.6	132	99.61	6.8	1100
2021-07-29	16.01	21.65	10.78	12.2	225	81.42	0	550
2021-07-28	15.73	21.24	10.81	14.9	154	95.99	8.6	1025
2021-07-27	17.97	24.71	14.64	17.2	172	96.3	8.4	605
2021-07-26	19.66	26.82	13.92	15.8	226	82.91	0	0
2021-07-25	17.19	21.89	13.82	17	133	99.69	0	0
2021-07-24	16.96	20.76	13.67	16.8	168	99.25	0	0
2021-07-23	16.55	20.08	13.61	16.4	90	99.83	0	865
2021-07-22	20.18	30.03	12.32	17.2	283	86.99	5	360
2021-07-21	20.5	28.29	14.51	18.6	288	90.8	0	0
2021-07-20	21.82	30.72	14.19	19.5	280	89.21	0	0
2021-07-19	20.87	28.37	12.99	18	313	86.97	0	0
2021-07-18	21.91	30.91	13.37	18.1	292	82.94	0	0
2021-07-17	21.39	30.04	11.43	17.9	324	84.17	0	0
2021-07-16	18.3	26.96	9.56	16.7	325	92.07	0	0
2021-07-15	16.72	22.57	11.07	16.5	191	99.34	0	0
2021-07-14	18.05	24.15	12.8	17.7	210	98.14	0	0
2021-07-13	16.91	20.98	13.81	16.8	153	99.84	0.2	960
2021-07-12	16.52	20.42	14.2	16.4	132	99.82	2.8	1225
2021-07-11	17.05	22.94	11.47	16.4	185	96.73	1.4	0
2021-07-10	17.87	23.57	13.19	16.3	233	92.25	0.2	820
2021-07-09	17.86	24.98	12.29	16.2	221	91.73	31	255
2021-07-08	18.02	23.42	13.42	16.6	202	92.57	0.2	710
2021-07-07	16.52	22.69	13.69	16.4	168	99.75	6	615
2021-07-06	15.3	19.86	12.8	15.1	185	99.2	8.4	640
2021-07-05	16.48	21.38	13.49	14.5	231	89.97	1	610
2021-07-04	17.07	24.67	11.85	16.7	218	98.28	5.4	305
2021-07-03	17.85	24.08	14.74	17.7	131	99.62	1	0
2021-07-02	17	23.83	11.36	15.6	245	93.31	0	0
2021-07-01	14.01	22.19	6.36	11.3	310	87.47	0	0
2021-06-30	13.56	17.92	7.83	13.5	125	99.86	0	0
2021-06-29	15.16	20.67	12.31	13.9	191	93.77	1.2	20
2021-06-28	13.86	16.28	11.96	13.8	77	99.81	0	0
2021-06-27	15.09	18.2	12.43	15	135	99.82	0.2	0
2021-06-26	14.39	18.83	10.89	14.3	197	99.84	0	925
2021-06-25	14.02	15.63	12.05	13.9	88	99.8	8.6	1100
2021-06-24	16.97	22.54	12.12	16.9	172	99.79	0	0
2021-06-23	14.81	22.22	5.36	9.8	344	77.62	0	0
2021-06-22	12.78	18.59	7.26	9.8	229	84.63	0	0
2021-06-21	12.76	17.31	8.5	12.2	176	97.5	0	0
2021-06-20	12.73	15.99	11.03	12.6	118	99.82	3.6	1040
2021-06-19	13.37	17.08	11.04	13.2	136	99.84	0.2	1105
2021-06-18	13.27	15.44	11.04	13.1	59	99.79	17.4	770
2021-06-17	16.75	19.9	14.48	16.6	112	99.82	4	1025
2021-06-16	20.48	27.31	12.48	14.4	339	74.79	0	0
2021-06-15	15.76	23.05	7.19	10.6	344	76.63	0	0
2021-06-14	18.83	23.03	10.36	15.7	267	84.2	0	0
2021-06-13	18.62	26.31	8.24	15.5	304	84.52	0	0
2021-06-12	16.8	22.1	11.5	11.7	316	75.59	0	0
2021-06-11	18.88	22.57	13.11	17.3	235	91.73	0	0
2021-06-10	18.97	23.78	14.07	17.8	177	93.93	0	0
2021-06-09	18.79	25.72	10.21	14.3	328	79.39	0	0
2021-06-08	17.38	23.52	11.72	12.5	341	78.15	0	0
2021-06-07	17.43	24.08	11.15	16	228	92.89	2.6	300
2021-06-06	16.37	19.87	11.84	16.3	154	99.88	0.2	0
2021-06-05	17.19	23.12	9.47	11.9	315	75.9	0	0
2021-06-04	15.03	17.49	11.39	12.4	164	86.54	0	0
2021-06-03	17.14	22.99	13.13	16.3	198	95.94	0.2	540
2021-06-02	17.07	25.35	7.86	13.9	313	84.71	0	5
2021-06-01	15.52	23.88	7.32	11.9	310	83.13	0	0
2021-05-31	14.05	22.28	7.47	12	316	89.46	0	0
2021-05-30	12.44	19.77	7.69	9.7	309	86.96	0	0
2021-05-29	15.91	22.23	9.56	11.6	291	80.64	0	0

2021-05-28	14.8	21.2	9.36	11.4	250	83.92	0	0
2021-05-27	11.83	17.66	5.34	11.4	207	98.04	0	680
2021-05-26	10.16	14.29	7.74	10	86	99.83	8.2	1120
2021-05-25	10.17	14.33	6.22	9.4	170	95.64	1.4	755
2021-05-24	9.29	14.43	5.7	8.8	178	97.81	12.2	1085
2021-05-23	9.19	14.72	3.19	7.8	204	92.37	5.4	175
2021-05-22	9.11	12.05	4.54	8.6	106	97.63	0.6	630
2021-05-21	11.06	13.2	10.17	10.9	86	99.84	16.6	1020
2021-05-20	9.67	13.22	4.05	9.5	98	99.86	7.6	425
2021-05-19	11.96	17.29	7.06	7.8	245	79.22	0.6	95
2021-05-18	11.28	18.39	5.7	8.3	232	85	0	0
2021-05-17	10.71	15.09	8.49	10.5	166	98.93	2.6	305
2021-05-16	11.34	17.13	8.28	10.6	222	96.03	1.8	620
2021-05-15	10.34	13.31	8.17	10.2	119	99.85	4.4	245
2021-05-14	9.46	11.73	7.47	9	98	97.7	0	0
2021-05-13	11.73	17.49	6.89	8.6	261	83.64	0	30
2021-05-12	11.72	16.3	7.17	9.6	227	89.03	0	425
2021-05-11	10.37	15.72	6.04	10	168	98.21	5.6	295
2021-05-10	12.3	16.24	8.67	11	183	93.56	4.4	230
2021-05-09	15.25	19.84	11.55	14.4	190	95.29	0	35
2021-05-08	10.26	15.47	3.14	10.1	61	99.83	18.2	975
2021-05-07	7.69	13.73	0.82	3.3	225	78.98	0	465
2021-05-06	5.71	12.17	0.77	2.2	211	82.28	1.6	665
2021-05-05	6.31	11.73	1.34	3.2	244	83.71	0.4	605
2021-05-04	7.55	11.1	4.13	6.9	140	96.59	5.6	640
2021-05-03	8.06	11.23	5.44	7.7	63	98.14	9.4	545
2021-05-02	7.42	14.34	-1.29	1.4	191	70.67	0	225
2021-05-01	6.42	11.3	-0.1	3.4	195	83.77	0	310
2021-04-30	4.73	10.35	-2.66	2.6	184	88.37	0.2	535
2021-04-29	4.55	10.56	-1.26	3.6	133	95.23	0.8	1090
2021-04-28	7.77	11.63	0.96	4.1	173	81.19	0	505
2021-04-27	7.75	12.1	4.16	6	84	90.34	2.2	325
2021-04-26	7.33	13.02	1.62	2.4	271	74.89	0	0
2021-04-25	6.73	12.62	-0.82	2.9	194	79.4	0	340
2021-04-24	8.48	17.18	-0.2	2.2	236	71.41	0	0
2021-04-23	9.3	18.92	-2.43	0.5	284	62.95	0	0
2021-04-22	6.34	15.29	-3.44	-3.5	289	61.49	0	0
2021-04-21	8.06	12.77	-0.29	4	178	78.82	0	0
2021-04-20	10.34	18.52	0.85	5.4	219	76.66	0	150
2021-04-19	7.94	16.83	-0.56	3.8	252	80.08	0	335
2021-04-18	7.2	16.14	-3.06	-0.8	279	66.09	0	140
2021-04-17	5.62	13.61	-3.92	-1	256	68.68	0	270
2021-04-16	4.23	11.11	-2.52	1.1	136	83.19	0	155
2021-04-15	4	10.99	-4.08	-0.4	183	77.56	0	110
2021-04-14	5.72	11.74	-1.15	0.6	230	74.51	0	20
2021-04-13	5.4	12.94	-3.95	-2.5	247	64.01	0	0
2021-04-12	3.53	11.12	-4.06	-2.2	244	74.72	0.2	595
2021-04-11	1.97	9.02	-2.8	0.5	150	91.79	0.6	395
2021-04-10	3.32	10.09	-2.36	-1	146	78.62	0.2	630
2021-04-09	6.92	9.66	3.7	4.8	113	88.25	0.2	455
2021-04-08	8.08	14.26	3.55	2.8	166	72.41	0	0
2021-04-07	3.19	8.19	-3.51	-5.4	196	56.27	0	0
2021-04-06	2.12	6.96	-0.99	-3.8	186	68	0	0
2021-04-05	5.32	9.67	1.23	-4.4	229	54.53	0	5
2021-04-04	7.12	16.75	-2.5	3.6	229	82.29	0	500
2021-04-03	5.91	10.07	-0.85	4.1	99	89.65	0	0
2021-04-02	6.51	10.36	3.2	3.9	99	84.77	0	0
2021-04-01	7.24	9.53	5.58	6.7	81	96.9	0	0
2021-03-31	15.37	23.72	8.44	9.6	183	73.63	0.2	0
2021-03-30	12.98	21.98	3.41	7.6	205	76.03	0	530
2021-03-29	13.7	19.16	9.33	12.4	197	93.21	0	30