



1
00:00:08,070 --> 00:00:06,070
when astronauts leave earth for places

2
00:00:09,750 --> 00:00:08,080
like an asteroid or mars one of the

3
00:00:11,589 --> 00:00:09,760
things we're trying to learn is how they

4
00:00:13,190 --> 00:00:11,599
can grow their own food since it's

5
00:00:14,549 --> 00:00:13,200
especially important that we may not be

6
00:00:15,990 --> 00:00:14,559
able to resupply them with food

7
00:00:17,990 --> 00:00:16,000
especially things like fruits and

8
00:00:21,349 --> 00:00:18,000
vegetables that's where a facility

9
00:00:23,189 --> 00:00:21,359
called veggie comes in and veggie is

10
00:00:25,429 --> 00:00:23,199
already proven that you can grow lettuce

11
00:00:27,029 --> 00:00:25,439
in space so now the question is is it

12
00:00:29,429 --> 00:00:27,039
safe to eat

13
00:00:31,349 --> 00:00:29,439

the first test went pretty well we had

14

00:00:33,750 --> 00:00:31,359

three plants that grew really well and

15

00:00:35,590 --> 00:00:33,760

they were harvested on space station by

16

00:00:37,910 --> 00:00:35,600

commander steve swanson when he was up

17

00:00:39,590 --> 00:00:37,920

there and everybody really enjoyed

18

00:00:41,590 --> 00:00:39,600

growing the plants from from the

19

00:00:43,430 --> 00:00:41,600

responses that we've heard

20

00:00:45,270 --> 00:00:43,440

we did have a few issues with the

21

00:00:47,350 --> 00:00:45,280

watering system for veggies so we're

22

00:00:49,910 --> 00:00:47,360

actually working on trying to get those

23

00:00:52,069 --> 00:00:49,920

issues solved and grow some more plants

24

00:00:53,110 --> 00:00:52,079

for the crew so what did you grow and

25

00:00:55,430 --> 00:00:53,120

did it grow

26

00:00:58,790 --> 00:00:55,440

so we grew red romaine lettuce the first

27

00:01:00,549 --> 00:00:58,800

time um and and it grew um and we had we

28

00:01:02,869 --> 00:01:00,559

had three good looking plants that were

29

00:01:05,429 --> 00:01:02,879

harvested we were um hoping to have six

30

00:01:06,630 --> 00:01:05,439

plants and one never germinated at all

31

00:01:10,550 --> 00:01:06,640

so we're trying to figure out what

32

00:01:12,870 --> 00:01:10,560

happened with that packet um i think um

33

00:01:14,630 --> 00:01:12,880

we're growing the the veggies in we call

34

00:01:16,390 --> 00:01:14,640

plant pillows they're little grow bags

35

00:01:17,990 --> 00:01:16,400

and so we brought that one back to

36

00:01:19,830 --> 00:01:18,000

figure out why it didn't grow and then

37

00:01:22,390 --> 00:01:19,840

two actually died because they had some

38

00:01:24,710 --> 00:01:22,400

water stress but the other three um grew

39

00:01:27,270 --> 00:01:24,720

fine commander swanson actually watered

40

00:01:28,710 --> 00:01:27,280

the plants directly and and that helped

41

00:01:30,630 --> 00:01:28,720

to save them

42

00:01:33,830 --> 00:01:30,640

stationary for veggies the five other

43

00:01:35,830 --> 00:01:33,840

pillows work without any problem

44

00:01:38,789 --> 00:01:35,840

uh it's great to hear so now we're

45

00:01:39,990 --> 00:01:38,799

figuring out why the watering system

46

00:01:41,990 --> 00:01:40,000

didn't

47

00:01:44,630 --> 00:01:42,000

perform in the way that we needed it to

48

00:01:46,710 --> 00:01:44,640

and we'll be able to try it again but it

49

00:01:48,870 --> 00:01:46,720

was it was red romaine lettuce was the

50

00:01:49,990 --> 00:01:48,880

first crop and did anyone taste it after

51

00:01:52,469 --> 00:01:50,000

it came back

52

00:01:55,270 --> 00:01:52,479

no so we harvested

53

00:01:57,109 --> 00:01:55,280

them in june and they were frozen on

54

00:01:59,510 --> 00:01:57,119

orbit because we really wanted to figure

55

00:02:01,109 --> 00:01:59,520

out the food safety the microbiology of

56

00:02:03,429 --> 00:02:01,119

these plants to know

57

00:02:05,109 --> 00:02:03,439

are they safe for the crew to eat um

58

00:02:08,469 --> 00:02:05,119

there's not really an easy way to wash

59

00:02:12,070 --> 00:02:08,479

your vegetables in space and so

60

00:02:14,790 --> 00:02:12,080

we had them frozen in melfi in the -80

61

00:02:17,430 --> 00:02:14,800

laboratory freezer on iss and then

62

00:02:19,510 --> 00:02:17,440

brought back on space x4 so we got those

63

00:02:22,790 --> 00:02:19,520

back around the end of october and we

64

00:02:24,150 --> 00:02:22,800

were able to look at the microorganisms

65

00:02:25,110 --> 00:02:24,160

on the plants

66

00:02:27,190 --> 00:02:25,120

so i know you're in the middle of

67

00:02:28,390 --> 00:02:27,200

analyzing the lettuce that came back but

68

00:02:30,869 --> 00:02:28,400

is there anything you can share with us

69

00:02:33,270 --> 00:02:30,879

right now that you've learned sure

70

00:02:35,670 --> 00:02:33,280

so we did preliminary food safety

71

00:02:37,430 --> 00:02:35,680

analysis of the microbiology

72

00:02:40,229 --> 00:02:37,440

and that looked about what we would

73

00:02:42,949 --> 00:02:40,239

expect on station um the levels were

74

00:02:45,190 --> 00:02:42,959

fairly consistent you know they they

75

00:02:47,270 --> 00:02:45,200

they probably are low enough that the

76
00:02:50,070 --> 00:02:47,280
food would actually be safe for the crew

77
00:02:51,990 --> 00:02:50,080
to eat so we're working right now with

78
00:02:55,190 --> 00:02:52,000
the advanced environmental health and

79
00:02:57,990 --> 00:02:55,200
the food folks to to get to that point

80
00:02:59,509 --> 00:02:58,000
we also analyzed the plants in terms of

81
00:03:02,309 --> 00:02:59,519
antioxidants

82
00:03:04,630 --> 00:03:02,319
anthocyanins phenolics and elements and

83
00:03:06,149 --> 00:03:04,640
those all looked pretty similar to the

84
00:03:07,589 --> 00:03:06,159
ground plants there might be some

85
00:03:10,869 --> 00:03:07,599
differences but we had such a small

86
00:03:12,790 --> 00:03:10,879
sample number it's a little hard to tell

87
00:03:14,630 --> 00:03:12,800
we're doing some other things right now

88
00:03:16,550 --> 00:03:14,640

in terms of the plant pillows and doing

89

00:03:19,270 --> 00:03:16,560

the analysis of those but that's still

90

00:03:21,350 --> 00:03:19,280

in work there is no up or down in space

91

00:03:23,190 --> 00:03:21,360

so how do the plants know where to go

92

00:03:25,750 --> 00:03:23,200

right or grow

93

00:03:27,830 --> 00:03:25,760

i mean it's it's a very good point um

94

00:03:29,990 --> 00:03:27,840

plants are are really interesting in

95

00:03:32,550 --> 00:03:30,000

that they kind of key in on different

96

00:03:34,390 --> 00:03:32,560

stimuli so in the absence of gravity the

97

00:03:36,070 --> 00:03:34,400

shoots grow towards the light you know

98

00:03:37,670 --> 00:03:36,080

and on earth shoots occur towards the

99

00:03:39,830 --> 00:03:37,680

light so in veggio we have the lights on

100

00:03:41,030 --> 00:03:39,840

top and the chutes grow up

101
00:03:42,550 --> 00:03:41,040
the roots

102
00:03:43,910 --> 00:03:42,560
you know they don't know which way is up

103
00:03:46,390 --> 00:03:43,920
and down but they'll tend to grow

104
00:03:48,789 --> 00:03:46,400
towards things like water gradients or

105
00:03:50,470 --> 00:03:48,799
pockets of nutrients

106
00:03:52,710 --> 00:03:50,480
and they get kind of contained in those

107
00:03:55,350 --> 00:03:52,720
plant pillows but one of the things that

108
00:03:57,509 --> 00:03:55,360
we're interested in veggie is looking at

109
00:03:59,429 --> 00:03:57,519
can we can we do x-ray scans of those

110
00:04:01,429 --> 00:03:59,439
plant pillows and see the roots and see

111
00:04:03,270 --> 00:04:01,439
how it's different so that's that's a

112
00:04:04,789 --> 00:04:03,280
really interesting question because

113
00:04:06,949 --> 00:04:04,799

getting that root zone right is the

114

00:04:08,550 --> 00:04:06,959

biggest challenge we've had so far

115

00:04:09,589 --> 00:04:08,560

now will this help with crop production

116

00:04:11,670 --> 00:04:09,599

on earth

117

00:04:14,070 --> 00:04:11,680

well i mean we're learning a lot of

118

00:04:16,710 --> 00:04:14,080

basic plant physiology using the space

119

00:04:19,110 --> 00:04:16,720

station you know veggie

120

00:04:21,030 --> 00:04:19,120

is one thing but we've had years of

121

00:04:22,629 --> 00:04:21,040

really great experiments and we still

122

00:04:24,230 --> 00:04:22,639

have a lot of really great experiments

123

00:04:26,070 --> 00:04:24,240

going on and we have some more hardware

124

00:04:29,350 --> 00:04:26,080

that's going to be going up in the next

125

00:04:31,110 --> 00:04:29,360

couple of years a very high-tech plant

126

00:04:34,070 --> 00:04:31,120

growth chamber called the advanced plant

127

00:04:36,550 --> 00:04:34,080

habitat where we'll get even more really

128

00:04:37,909 --> 00:04:36,560

solid information on plant physiology in

129

00:04:40,550 --> 00:04:37,919

space

130

00:04:43,590 --> 00:04:40,560

and you know we're also learning about

131

00:04:45,670 --> 00:04:43,600

building better plant growth systems

132

00:04:47,189 --> 00:04:45,680

the lighting studies that we've done

133

00:04:49,830 --> 00:04:47,199

here on earth trying to figure out

134

00:04:52,710 --> 00:04:49,840

what's the most effect or efficient form

135

00:04:54,950 --> 00:04:52,720

of electric lighting are are being used

136

00:04:56,870 --> 00:04:54,960

in commercial greenhouse industries now

137

00:04:58,629 --> 00:04:56,880

you know the same types of led lighting

138

00:05:00,469 --> 00:04:58,639

that we're using on veggie

139

00:05:02,550 --> 00:05:00,479

is going on in commercial greenhouses

140

00:05:04,950 --> 00:05:02,560

around the world and in things like

141

00:05:08,230 --> 00:05:04,960

plant factories vertical urban

142

00:05:09,909 --> 00:05:08,240

agriculture so right there a lot of this

143

00:05:13,029 --> 00:05:09,919

nasa research you know is kind of

144

00:05:15,749 --> 00:05:13,039

translating into commercial

145

00:05:18,950 --> 00:05:15,759

applications that help us grow healthier

146

00:05:21,350 --> 00:05:18,960

you know more efficient more

147

00:05:23,110 --> 00:05:21,360

energy efficient more labor-efficient

148

00:05:24,390 --> 00:05:23,120

types of crop plants you know because we

149

00:05:26,790 --> 00:05:24,400

got a lot of people to feed on this

150

00:05:29,830 --> 00:05:26,800

planet so anything that we can learn

151
00:05:31,110 --> 00:05:29,840
can you know hopefully translate

152
00:05:32,390 --> 00:05:31,120
so what are the types of plants you're

153
00:05:34,550 --> 00:05:32,400
looking at next

154
00:05:36,629 --> 00:05:34,560
so the the next types of plants that

155
00:05:39,749 --> 00:05:36,639
we're thinking about growing

156
00:05:42,870 --> 00:05:39,759
are more leafy greens for for the near

157
00:05:44,070 --> 00:05:42,880
term because um they grow more quickly

158
00:05:46,390 --> 00:05:44,080
and they're something that the crew

159
00:05:49,029 --> 00:05:46,400
might be able to eat as a salad in you

160
00:05:51,029 --> 00:05:49,039
know in the next you know year or so and

161
00:05:53,590 --> 00:05:51,039
that would be ideal so we're looking at

162
00:05:55,430 --> 00:05:53,600
like small chinese cabbages and other

163
00:05:58,870 --> 00:05:55,440

varieties of leafy greens that would

164

00:06:01,270 --> 00:05:58,880

taste good be nutritious and grow well

165

00:06:03,270 --> 00:06:01,280

and then in a little farther out we're

166

00:06:05,430 --> 00:06:03,280

starting to look at dwarf peppers and

167

00:06:07,670 --> 00:06:05,440

dwarf tomatoes because we want these

168

00:06:09,909 --> 00:06:07,680

other components of the salad system you

169

00:06:11,830 --> 00:06:09,919

know a salad is not just lettuce so

170

00:06:13,670 --> 00:06:11,840

it'll be nice to have that variety as

171

00:06:15,430 --> 00:06:13,680

well

172

00:06:17,430 --> 00:06:15,440

and in case you're wondering the lights

173

00:06:20,390 --> 00:06:17,440

are purple they look a little pink but

174

00:06:21,749 --> 00:06:20,400

red plus blue leds equals purple

175

00:06:23,430 --> 00:06:21,759

because plants need those kind of

176
00:06:24,790 --> 00:06:23,440
wavelengths to grow now plants are green

177
00:06:27,670 --> 00:06:24,800
because they reflect most of the green

178
00:06:29,350 --> 00:06:27,680
light but absorb the red and blue so

179
00:06:30,870 --> 00:06:29,360
there are some green leds in the veggie

180
00:06:33,029 --> 00:06:30,880
as well and and that's really to make

181
00:06:34,710 --> 00:06:33,039
the plants look green and that's really

182
00:06:36,710 --> 00:06:34,720
for the crew and and not really the

183
00:06:38,629 --> 00:06:36,720
plants the astronauts really apparently

184
00:06:40,790 --> 00:06:38,639
seem to like the purple lights uh

185
00:06:43,510 --> 00:06:40,800
they've taken a ton of photos just the

186
00:06:45,590 --> 00:06:43,520
lights off and the columbus module and