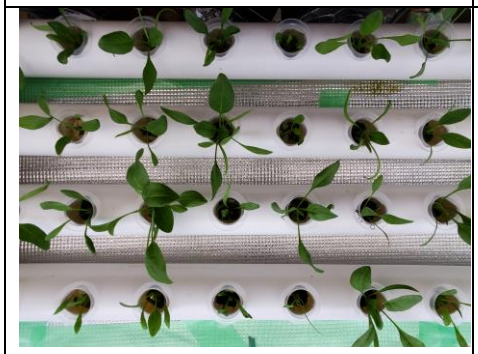
Created Feb 24, 2023 Akagi

Hydroponic Cultivation Report Spinach Final Report on Harvest

Shooting date February 24 Harvest

Fixed-point observation progress report			
Growth rate Recording and measurement date			
① Jan 14 Report -0.7%	② Jan 20 Report 8.1%	③ Jan27 reported 16.7%	④ Feb 03 Report 20.2%
			
⑤ Feb 10 Report 28.3%	⑥ Feb 17 Report 25.0%		
 			

Growth record

O-4 EA Water + Liquid Fertiliz	8.5	7.3		Growth Difference			
20-Jan	10	10		118%	137%		127%
27-Jan	13	11		130%	110%		120%
3-Feb	16	12	14.5	123%	109%		116%
10-Feb	19	15	17.5	119%	125%	121%	121%
	23	24	24.5	121%	160%	140%	140%

			Growth
1月14	TAP	28.5	
	HHO	28.3	99.3%
1月20	TAP	34.5	
	HHO	37.3	108.1%
1月27	TAP	39	
	HHO	45.5	116.7%
2 月 3	TAP	44.5	
	HHO	53.5	120.2%
2 月10	TAP	79.5	
	HHO	102	128.3%
2 月17	TAP	116	
	HHO	145	125.0%

HHO/Tap Growth contrast (sideview)

TAP ← → HHO

Arranged in an

easy-to-understand manner

Leaf width size

	HHO	TAP
width	7.0	6.0

Leaf length size

	HHO	TAP
length	11.5	8.5

Fresh weight

Fresh weight

HHO 単位(g) 新鮮重 新鮮重率

1	2	3		
27.6	15.7	12.5	**18.6**	**209.8%**

TAP

1	2	3	
9	8.9	8.7	**8.9**

Fresh weight rating

： Fresh weight comparison (HHO/TAP) was 209.8%, with HHO effect.

： On the other hand, the stem length was 125%, resulting in a lean size.

1. Too small and incomparable when compared to shipping standard

※It is speculated that the cause of the low fresh weight is a phenomenon due to a long unhealthy range.

2. The root grew abnormally because the harvest time from sowing took about three times longer than usual, but the growth of the root and stem grew unbalanced.

water quality

1. Water change 1 time/week
2. DO 12～15ppm
3. ORP −250~340mv
4. H2O2 0.5～1ppm

Cultivation observation

Sowing to harvest records

Varieties ・ Jiromaru ・ Two types of "resistant to cold"

sowing ・Nov 19

Germination・Slightly germinated from the end of November. 1% glycerin was mixed to promote it, and 70~80%

germinated in early December.

Measures against cold

① As the cold increased in December, cold protection measures were taken to cover the entire hydroponic cultivation equipment on December 9 to enhance the greenhouse.

② The temperature controller was kept warm only during the day (≈ 15 hours), but the effect of pulling the night temperature and the like below the optimum temperature for growth was weak.

③ Since January 20, a full-day temperature controller has been used and the water temperature has been set at 20°C, resulting in smooth growth.

Lack of sunlight ・There was room for improvement due to lack of sunlight in winter and lack of sunlight due to the location of the cultivation site.

(Later LED culling)

Total growing period: 99 days (3 times normal)

Harvest/HHO effect

① Despite the lack of a growing environment, the effect of HHO was clear.

② The stem length and root length are not inferior, but it should be noted that fresh weight is not in good condition and will grow with sufficient measures.

③ Again, we will take measures against upset and grow "spinach".

Created Feb 17, 2023 Akagi

Hydroponics Report Spinach

Shooting date February 17

Fixed point observation date February 17	Growth Rate Comparison Table※From February 10 to 17, HHO growth difference is plus
	① January 14 Report -0.7% ② January 20 Report 8.1% ③ January 27 Report 16.7% ④ February 03 Report 20.2% ⑤ February 10 Report 28.3% ⑥ February 17 Report 25,0%

Growth record

O-4 EA Water + Liquid Fertiliz	8.5	7.3		Growth rate			
20-Jan	10	10		118%	137%		127%
27-Jan	13	11		130%	110%		120%
3-Feb	16	12	14.5	123%	109%		116%
10-Feb	19	15	17.5	119%	125%	121%	121%
	23	24	24.5	121%	160%	140%	140%

			成長差
1月14	TAP	28.5	
	HHO	28.3	99.3%
1月20	TAP	34.5	
	HHO	37.3	108.1%
1月27	TAP	39	
	HHO	45.5	116.7%
2 月 3	TAP	44.5	
	HHO	53.5	120.2%
2 月10	TAP	79.5	
	HHO	102	128.3%
2 月17	TAP	116	
	HHO	145	125.0%

Temperature environment		Observation period February 10~17
・Water temperature17°C~22.5°C ・House room temperature 16°C~22°C ・Outside temperature -1°C~7°C in the morning 4°C~15.2°C	・Temperature controller use, 24 hours ・0°C~8°C at night ・Average maximum temperature: 12.5°C Average minimum temp 2.8°C	1 HHO produced water grows about 5~6 days early. 2 The growing period up to the shipping grade (M.=25cm (stem length) i about 6~7 days 3 The market shipment is 200g as a guide, so fresh weight is scheduled f around February 27. 4 A total of 80 days have passed. The harvest period is expected to be 95~ days.

during the day		5 The growing environment in the seedling stage ~ long-term was particul important, but there was a problem with water temperature control. 6 The point of growth can be understood from the fact that this period ta 2/3 of the total. 7 The harvest season is around the 27th of next week.

Created Feb 10, 2023 Akagi

Hydroponics Report Spinach

Shooting date: February 10

Fixed point observation date Feb-10

Growth Rate Comparison Table *HHO's growth differential from February 3 to 10 was plus 28.3%.

① Jan 14 Report -0.7%

② Jan 20 Report 8.1%

③ Jan 27 reported 16.7%

④ Feb 03 Report 20.2%

⑤ Feb 10 Report 28.3%

成長記録

w/Q		A	B					
TAP	**NO-1 Liquid fertilizer only**	5.5	9		Growth rate			
	20-Jan	8	9		145%	100%		123%
	27-Jan	8.5	10.5		106%	117%		111%
	3-Feb	10	12	10	118%	114%		116%
	10-Feb	12	13.5	12	120%	113%	120%	118%
	NO-2 Liquid fertilizer only	7	7		Growth rate			
	20-Jan	9.5	8		136%	114%		125%
	27-Jan	10	10		105%	125%		115%
	3-Feb	11.5	11	13.5	115%	110%		113%
	10-Feb	14	13.5	14.5	122%	123%	107%	117%
HHO	**O-3 EA Water + Liquid Fertiliz**	5	7.5		Growth rate			
	20-Jan	8	9.3		160%	124%		142%
	27-Jan	9.5	12		119%	129%		124%
	3-Feb	12	13.5	14.5	126%	113%		119%
	10-Feb	15	18	17.5	125%	133%	121%	126%
	O-4 EA Water + Liquid Fertiliz	8.5	7.3		Growth rate			
	20-Jan	10	10		118%	137%		127%
	27-Jan	13	11		130%	110%		120%
	3-Feb	16	12	14.5	123%	109%		116%
	10-Feb	19	15	17.5	119%	125%	121%	121%

Temperature environment		Observation period: Feb 4~Feb 10
Water temperature 16°C~21.5°C ・House room temperature 12°C~21°C ・Outside temperature -1°C~7°C in the morning 4°C~15.2°C during the day	・ Use temperature controller, 24 hours ・-1°C~7°C at night ・Average maximum temperature: 11.5°C Average minimum temperature 2.2°C	1 HHO produced water grows about 7 days early. 2 The growing period up to the shipping grade (M.=25cm (stem length) is about 6~7 days 3 The market shipment is 200g, so fresh weight is scheduled for February 20. 4 A total of 80 days have passed. The harvest period is expected to be 95~100 days. 5 The growing environment in the seedling stage ~ long-term was particularly important, but there was a problem with water temperature control. 6 The point of growth can be understood from the fact that this period takes 2/3 of the total.

Created Feb 3, 2023 Akagi

Hydroponics Report Spinach

Shooting date: February 3

Fixed point observation date February 03

Growth rate vs.

※**HHO/TAP growth differential from 28 to 3 February plus 20.2%**

① Jan 14 Report -0.7%

② Jan 20 Report 8.1%

③ Jan 27 Report 16.7%

④ Feb 03 Report 20.2%

Growth record

w/Q		Fixed point A	Fixed point B			
TAP	**NO-1 Liquid fertilizer only**	5.5	9	Growth rate		
	20-Jan	8	9	145%	100%	123%
	27-Jan	8.5	10.5	106%	117%	111%
	3-Feb	10	12	118%	114%	116%
	NO-2 Liquid fertilizer only	7	7	Growth rate		
	20-Jan	9.5	8	136%	114%	125%
	27-Jan	10	10	105%	125%	115%
	3-Feb	11.5	11	115%	110%	113%
HHO	**O-3 EA Water + Liquid Fertiliz**	5	7.5	Growth rate		
	20-Jan	8	9.3	160%	124%	142%
	27-Jan	9.5	12	119%	129%	124%
	3-Feb	12	13.5	126%	113%	119%
	O-4 EA Water + Liquid Fertiliz	8.5	7.3	Growth rate		
	20-Jan	10	10	118%	137%	127%
	27-Jan	13	11	130%	110%	120%
	3-Feb	16	12	123%	109%	116%

			成長差
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	HHO	28.3	99.3%
1月20	TAP	34.5	
	HHO	37.3	108.1%
1月27	TAP	39	
	HHO	45.5	116.7%

	※Jan20 The report was a bookkeeping error.	
Growing environment		Observation period: January 28~Feb 03
・water temperature　11℃～21.5℃ ・House room temperature　6～17℃ ・Outside temperature Morning -3℃～3℃ Day 4℃～12℃	・Temperature controller・AM6：30　ON PM 9：30　OFF ・night -3℃～3℃ ・Average maximum temperature　7.7℃ ・Average minimum temperature　-0.4℃	1．From January 28th, day and night temperature controller will be used, and the water temperature will be set to 20 degrees Celsius and the room temperature will be set to 15°C~18°C. ※Early morning is below freezing, so to prevent poor growth 2．LED illuminated from 3:00 PM to 10:00 PM

Created Jan 27, 2023 Akagi

Hydroponics Report Spinach

Photo taken on January 27			

Fixed-point growth observation		Observation period: January 21~27
・water temperature 1 1℃～2 1 .5℃ ・House room temperature　6～17℃ ・Outside temperature morning -3℃～3℃ day 4℃～12℃	・Temperature controller・ AM6：30　ON PM 9：30　OFF ・night -3℃～3℃ ・Average maximum temperature　7.7℃ Average minimum temperature　-0.4℃	1　This week, the night temperature was below freezing, but there were 3 days and I turned on the temperature controller all day. 2 The room temperature of greenhouse cultivation and hydroponics in winter for commercial use is generally controlled at 20°C~23°C. 3　The water temperature is reduced by several degrees.

Fixed point observation date Jan27

Growth Rate Comparison Table

※ **HHO/TAP growth differential from January 21 to 27: plus 8.1%**

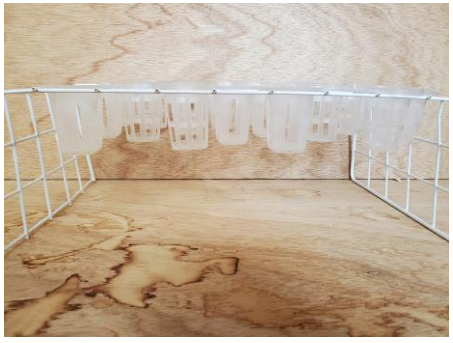
w/Q		Fixed point A	Fixed point B	Growth rate		成長差
TAP	**NO-1 Liquid fertilizer only**	5.5	9	Growth rate		
	20-Jan	8	9	145%	100%	123%
	27-Jan	8.5	10.5	106%	117%	111%
	NO-2 Liquid fertilizer only	7	7	Growth rate		
	20-Jan	9.5	8	136%	114%	125%
	27-Jan	10	10	105%	125%	115%
HHO	**O-3 EA Water + Liquid Fertiliz**	5	7.5	Growth rate		
	20-Jan	8	9.3	160%	124%	142%
	27-Jan	9.5	12	119%	129%	124%
	O-4 EA Water + Liquid Fertiliz	8.5	7.3	Growth rate		
	20-Jan	10	10	118%	137%	127%
	27-Jan	13	11	130%	110%	120%

New hydroponic varieties	Microgreens = Italian parsley, basil, romaine lettuce

Image of training equipment

HHO Tank

TAP Tank



for root length photography

Key points of this article

1 Structure that allows contrasting images of the growth process

2 HHO/TAP divided into individual tanks

3 Nursery shelves are arranged in parallel to make it easy to observe growth differences.

4 Environment settings with an emphasis on the actual cultivation environment (air temperature, water temperature)

Aquarium structure

HHO Tank	TAP Tank
parsley	parsley
basil	basil
lettuce	lettuce

※Observe in 10~12 pots each

Spinach TAP Bath

Spinach TAP Bath

Spinach HHO Bath

Spinach HHO Bath

Water quality regulator for TAP

・heat insulation

・water pump

・Liquid fertilizer

HHO 用水質調整槽

・EA Generation

・heat insulation

・water pump

・Liquid fertilizer

Created Jan 20, 2023 Akagi

Hydroponics Report Spinach

1） As a result of consolidating germination and poor growth into 36 strains and 7 days have passed, growth has become noticeable.

Photo taken on January 20			
Germination fixed-point observation		Growth environment January 15~20	
	・Growth became noticeable See below. ※I'll delete this image from next time.	・water temperature 15℃～21℃ ・House room temperature 13～21℃ ・Outside temperature Morning 1℃～8℃ Day 8℃～13℃	・Temperature controller・ AM6：30 ON PM 9：00 OFF ・Night1℃～5℃ ・Average maximum temperature 10.1℃ ・Average minimum temperature 3.8℃
Fixed-point observation: January 20 	Growth Rate Comparison Table		

w/Q		Fixed point A	Fixed point B		
TAP	**NO-1 Liquid fertilizer only**	5.5	9	Growth rate	
	20-Jan	8	9	145%	100%
	27-Jan				
	NO-2 Liquid fertilizer only	7	7	Growth rate	
	20-Jan	9.5	8	136%	114%
	27-Jan				
HHO	**NO-3 EA Water + Liquid Fertilizer**	5	7.5	Growth rate	
	20-Jan	8	9.3	160%	124%
	27-Jan				
	NO-4 EA Water + Liquid Fertilizer	8.5	7.3	Growth rate	
	20-Jan	10	10	118%	137%

Remarks

1 . It is now possible to visually determine the overall growth.

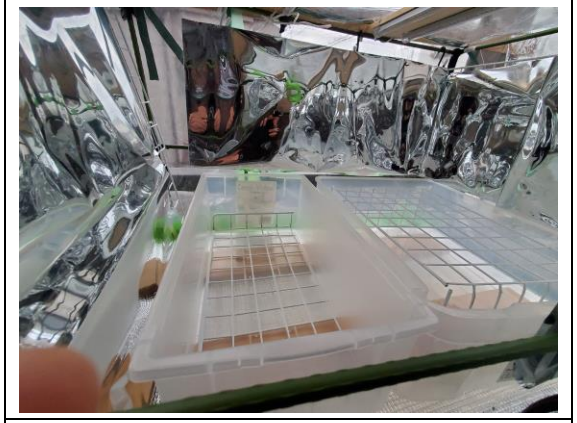
2. HHO is growing by about **4%** compared to TAP

※The results of the next few observations will clarify the changes due to water quality.

New hydroponic varieties	Microgreens = Italian parsley, basil, romaine lettuce

Internal Images

※Aluminum film around



LED

Features ※Observed growth difference between EA generated water (HHO) and tap water purpose

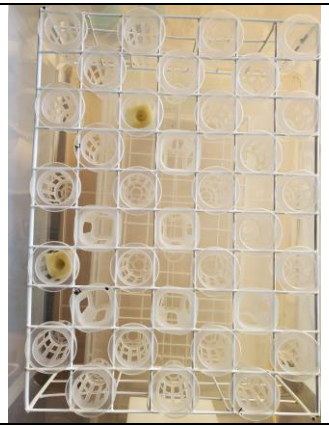
LED hydroponics is widespread. Japan Antarctic research expedition eats preserved food unchanged for six months to a year.

If you eat fresh green and yellow vegetables grown by hydroponics on ocean voyages and observation bases, and if you can see changes in the growth process and greenery, you will be able to live a healthy research life both physically and mentally.

・3 Timing Modes
・6 Dimming Levels
・3 Lighting Modes
・4-Switch Mode/OFF
・Color = red, blue, natural diet
・Power consumption　0.027kw month 4.9kw
・Electricity bill ≒¥170/month

With the entry into the EA market, we believe that the market for long-term consumers will expand.
As a cross-sectional proposal, comprehensive proposals, including proposals for solutions to environmental pollution such as bilge and ballast water using ship waste oil, are attractive.

① Hydroponic cultivation position is on the east face, with few daylight hours
② Since it affects photosynthesis, it is irradiated with hydroponic LEDs to promote growth.
③ Adjust the illumination time, dimming level, and lighting mode according to growth.
④ The maximum power consumption is 0.027wk, which is about ¥142 per month as 35H/unit price, 5H/day.
⑤ There are two water flows: HHO (spinach/microgreen) and TAP (spinach/microgreen).
⑥ Although there are issues with the initial investment in LED irradiation, we will continue to observe the growth and contrast with HHO.

HHO	TAP
	

Created Jan 8, 2023 Akagi

Hydroponics Report Spinach

1） 46 days have passed since sowing, and individual growth differences have become clear, so poor seeding and low growth rates have been removed and the concentration has been concentrated at 50%.

January 7

Kind　Germination rate & position　Created on　7-Jan

Kind	A	B	C	D	E	F	G	H	I		
寒さに強い	1									1	
	1		1	1						3	
					1				1	2	
						1	1	1		3	
										9	75% germination rate
次郎丸	1	1		1			1	1		5	
								1		1	
		1	1					1		3	
	1								1	2	
										11	69% germination rate

Remarks

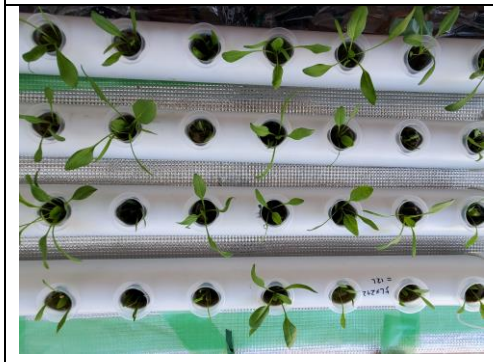
Poor germination

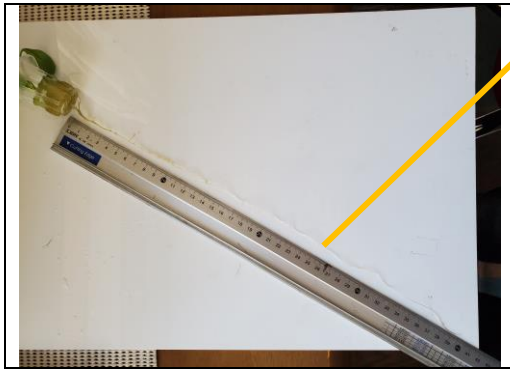
1 .Germination rate varies depending on the brand

2 .The indicated germination rate is 80%, but the aver germination rate is 72%

3 .The reason why it is lower than the display is that t growth temperature has not reached the appropriate

4 .7Resistant to cold / Jiromaru's low growth rate is removed from the pot and raised at

Photo taken on January 8			
Germination fixed-point observation		Growing environment: January 3~January 8	
	1．Grows to 7~9cm	・Water temperature 17°C~21°C ・House room temperature13~22°C ・Outside temperature 1°C~3°C in the morning ・Daytime 10°C~11°C	・Temperature controllerAM6：30　ON PM 9：30　OFF ・night 1℃～3℃ ・Average maximum temperature　10.3℃ ・Average minimum temperature　1.5℃
	⇐・Left figure: 50% of products with good growth potential Growing environment 1．Growth became noticeable from the second half of December. 2．Upper row of the left figure device = liquid fertilizer only ：Bottom row = EA produced water + liquid fertilizer 3．　In the future, we will observe growth differences due to water quality.		

	※ It had an unusually long root length (51 cm). ※ 比率　5/３６　14% ※ I investigated the cause but I don't know (it doesn't seem to be mold)

Created Jan 2, 2023 Akagi

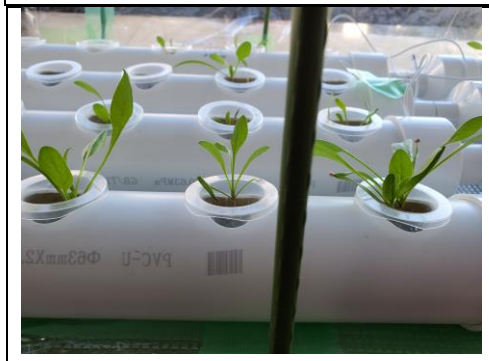
Hydroponics Report Varieties and spinach

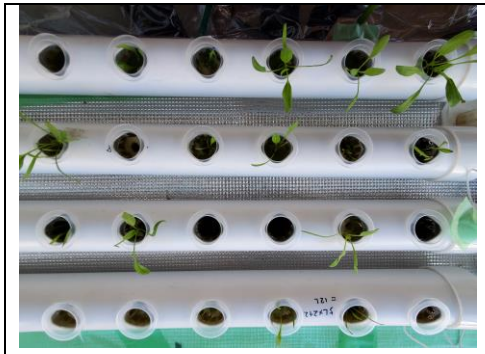
※Germination was delayed due to low-temperature cultivation in winter, but both types sprouted 80~90%. (・Resistant to cold・Jiromaru)

◎About 20% do not germinate, so remove it from the pot.

※From this week, we have been observing only EA generated water and tap water, but there is no growth difference.

※As pointed out by Nick, the DO concentration of EA produced water is 9~10ppm.

Photo taken on Jan2			
Germination fixed-point observation		Mature environment Dec 26 ~ Jan 2	
	1. Only this place has grown to about 5~6cm, but the others are only a few cm. 2. 20~25% growth rate	・Water temperature 17°C~21°C ・House room temperature 13~22°C (by solar radiation) ・Outside temperature -2°C~1°C in the morning Daytime 6°C~15°C	・Turn on the temperature controller at 6:30 a.m. 9:30 p.m. ・-2°C~1°C at night ・Average high temperature 9.1°C ・ 1℃Average minimum temp 1°C

	・Roughly 80% germinated, but on average Jiromaru grows well. ・Variety = [resistant to cold] has a germination rate of about 5% lower. ***Growing environment*** 1. Suitable temperature is 10~20°C 2. It can withstand -10~-15°C, but root elongation stops at 0°C. 3. The accumulated temperature is about 650~700°C. ※The cumulative temperature from December is estimated to be 245°C. According to desk calculations, it will take about two months to harvest.

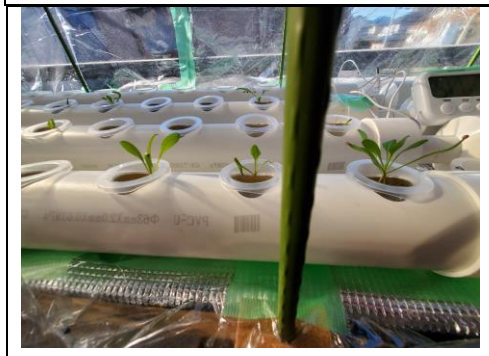
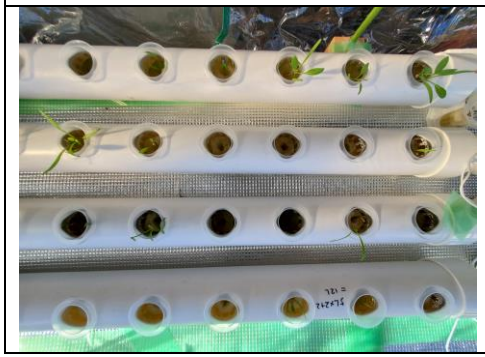
Created Dec 25, 2022 Akagi

Stage 4: Hydroponics Report
Varieties spinach

※Germination was delayed due to low-temperature cultivation in winter, but both types sprouted 80~90%. (・Resistant to cold・Jiromaru)

◎Both types have a germination rate of 80% or more, so they are abbreviated.

※From this week, we will observe only EA generated water and tap water.

<table>
<tr><td>Photo taken on Dec 24</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Germination fixed-point observation</td><td colspan="2">Growth environment Dec 16~25</td></tr>
<tr><td>  </td><td>※Only this place has grown to about 4~5cm, but others are only a few cm.</td><td>・水温 Water temperature 17°C~21°C
・House room temperature 13~22°C
・Outside temperature 0°C~5°C in the morning Intraday 8°C~14°C</td><td>・Temperature controller on 6:30 AM　9:30 p.m.
・-2°C~5°C at night
・Average high temperature 10.7°C
・Average minimum temperature 2.5°C</td></tr>
<tr><td>  </td><td colspan="3">※Roughly 80% germinated, but there is uneven growth.
※The two types of germinated compost are still ahead.</td></tr>
</table>

Created Dec 25, 2022 Akagi

Stage 4: Hydroponics Report
Varieties spinach

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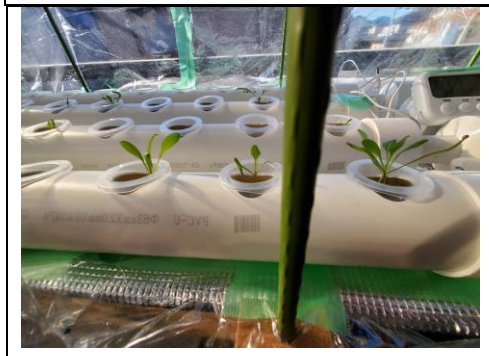
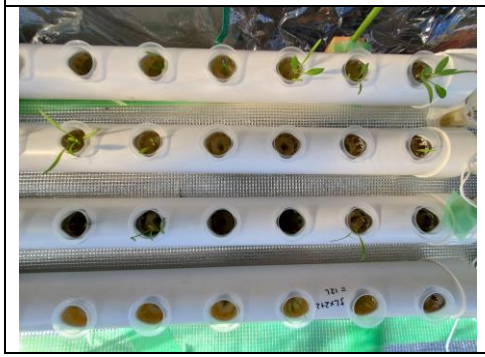
<tr><td>  </td><td>※Only this place has grown to about 4~5cm, but others are only a few cm.</td><td>・水温 Water temperature 17°C~21°C
・House room temperature 13~22°C
・Outside temperature 0°C~5°C in the morning Intraday 8°C~14°C</td><td>・Temperature controller on 6:30 AM　9:30 p.m.
・-2°C~5°C at night
・Average high temperature 10.7°C
・Average minimum temperature 2.5°C</td></tr>
<tr><td>  </td><td colspan="3">※Roughly 80% germinated, but there is uneven growth.
※The two types of germinated compost are still ahead.</td></tr>
</table>

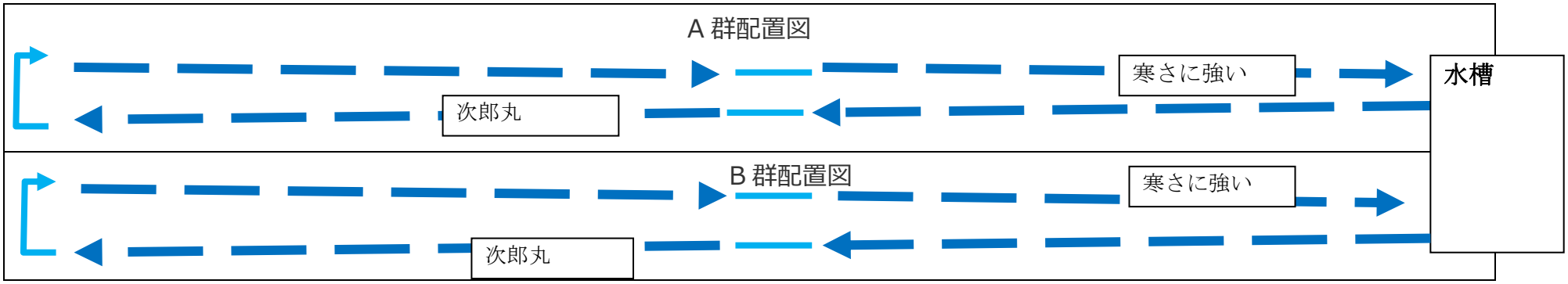
作成日　2022年１２月１６日　赤木

水耕栽培報告
ほうれん草

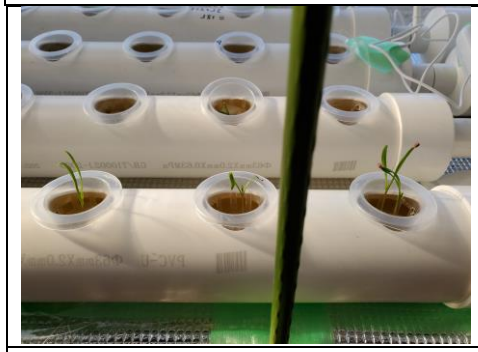
※冬期低温栽培のため、非常に成長が遅いので、一定期間水管を平行に並べ、HHOのみで栽培しています。

※２種類のほうれん草（寒さに強い・治郎丸）を同条件で成育し変化を観察します。

配置図



①　２系統を配置し、同じ水槽から循環している

１２月１５日　撮影			
発芽　拡大図　　（混生）		成育環境　12月5～１２月１５日	
		・水温　20℃ ・ハウス室温　13～20℃ ・外気温　朝4～7℃ 日中　12～１５℃	・温調器をAM6：00　on PM10：00　OFF ・夜間は0～6℃ ・平均最高気温　13.2℃ 平均最低気温　4.5℃
※ポットから数センチまで成長しました。			