



Grow finished plants

The example we have chosen is [Boston Blue Bell](#) but other [Nephrolepis](#) varieties can be grown in the same way.

Light

Blue Bell grows best at 20.000 lux (2.000 footcandles).

In summer shade (50% to 80%) is necessary; the frond length will increase in line with the level of shade and ferns will become less compact.

Increasing light will encourage more compact growth, smaller fronds and a thicker texture. This will improve the plant quality.

The more upright varieties, such as '[Emerald Queen](#)', are often grown under much brighter light, ranging from 50% shade to full sun.

Temperature

While ferns will tolerate great extremes of temperatures, optimal growth occurs between 70° and 90°F (21 - 30°C). for a greenhouse the optimum temperature is 21°C for the day with a minimum of 65°C F (18°C) for the night. Temperatures below 60°F (16°C) will slow down growth significantly.

Fertilizing and Substrates

Growing media

Good drainage and water retention capacity are essential. Ferns cannot tolerate 'wet feet'. Use a blend of peat with perlite, adding bark or other materials for good drainage. Adjust the pH between 5.0 and 6.0.

Fertilization with complete fertilizers (ready to use plant foods)

Ferns thrive on consistent feeding at K-P-N= 24-8-16. Also 20-20-20 or 20-10-20 is possible. EC watering: between 125 to 175ppm. Add a source of sulfur occasionally, e.g. magnesium sulfate. Be sure to leach regularly to prevent any build-up of salt in the pot. If applying liquid feed to the foliage, be sure to rinse off afterwards. When incorporating dry fertilizer in the medium, do not include extra trace element blends.

Single-element fertilizers

1. Standard feeding solvent for head elements and trace elements measured in the feeding solution.

FEEDING ELEMENT	STANDARD FEEDING SOLVENT	
	1st half of the culture (week 1 till 8)	2nd half of the culture (week 8 till 16)
NH4	1.1	1.0
K	5.5	5.5
Ca	3.0	2.5
Mg	0.75	0.75
NO3	10.6	8.0
SO4	1.0	1.75
P	1.5	1.5
EC	1.7	1.5
Fe	15	15
Mn	5	5
Zn	3	3
B	10	10
Cu	0.5	0.5
Mo	0.5	0.5

2. Feeding targets for head elements(mmol/l) and trace elements(micromol/l) measured in the peat.

FEEDING SOLVENT	1st HALF OF THE CULTURE		2nd HALF OF THE CULTURE	
	target numbers	limits	target numbers	limits
NH4	<0.1		<0.1	
K	1.6	1.3-1.9	1.6	1.3-1.9
Ca	1.2	0.8-1.6	1.0	0.7-1.3
Mg	0.5	0.3-0.7	0.5	0.3-0.7
NO3	4.0	3.2-4.8	3.0	2.4-3.6
SO4	0.8	0.5-1.1	1.4	0.8-2.0
P	0.5	0.4-0.6	0.5	0.4-0.6
EC	0.68	0.5-0.9	0.84	0.6-1.1
pH		5.2-6.0		5.2-6.0
Fe	8	5.0-10.0	8	5.0-10.0
Mn	2	1.0-3.0	2	1.0-3.0
Zn	2	1.5-2.5	2	1.5-2.5
B	15	10.0-25.0	15	10.0-25.0
Cu	0.7	<1.0	0.7	<1.0

- Based on A and B reservoirs
- Each containing 1000 liter en 100 times concentrated
- Rainwater is used

A-reservoir	Ammoniumnitraat	10 kg or 8 liter		
	Kalksalpeter	100 kg		
	Ijzerchelaat (DTPA 3%)	6 liter		
B-reservoir	Kalisalpeter	37.5 kg		
	Monokalifosfaat	25 kg		
	Bitterzout	50 kg		
	Kalisulfaat	5 kg		
	Mangaansulfaat	135 gr		
	Borax	190 gr		
	Zinksulfaat	85 gr		
	Kopersulfaat	12 gr		
	Natriummolybdaat	12 gr		
Schedule in mmol/L.	NH4	1.55	NO3	14.5
	K	6.15	SO4	2.3
	Ca	4.6	H2PO4	1.8
	Mg	2.0		
		20.9		20.9
Schedule in umol/L.	Fe	40		
	Mn	8		
	Zn	3		
	B	20		
	Cu	0.5		
	Mo	0.5		

Diseases and Treatments

Ferns have very low susceptibility to diseases and pests. Occurring fern diseases are often eradicated or kept under control in the greenhouse by taking sound and practical measures into account.

Key is that the fern is in a good condition. At Vitro Plus we are engaged in resiliency programs of the companies Koppert and Synvital. This has a positive effect on the crop that looks healthy and strong. By enhancing the fern with a higher resistance it will become more immune to aggressors, such as bacteria, fungi and insects. In addition sanitary measures are of utmost importance too:

- Always use clean irrigation water (water at Vitro Plus is not recycled, it is well aerated in the silos to prevent the growth of anaerobic microorganisms)
- Adequate ventilation in the greenhouse
- Always ensure that infested plants and weed are immediately removed from the greenhouse

Fungi and Bacteria

These groups of organisms such as Pythium, Rhizoctonia and Botrytis can cause stem rot to young ferns. To prevent this from happening please avoid watering ferns from above and do not leave root balls too moist for too long. To control it pesticides such as Flint and Rovral are used in The Netherlands.

Green and Black Aphid

Aphids do not often appear in ferns, however you can come across them in greenhouses. In this case, it will be scouting, monitoring and removing of infested plants. For a more biological control of Aphid, natural enemies such as gall midges and ladybirds are being used. Furthermore there is also the possibility of using environmental friendly products based on natural botanical oils.

We use chemical pesticides in The Netherlands, such as Plenum, Tepekki and Flipper when the problem occurs to be very persistent.

Mealy bugs and scale insects

These are pests that can appear in ferns. Drastic measures must be taken into account to eliminate them. Monitoring and removing is the best option and the quicker, the better here. After clearing the infested section of the greenhouse it also needs to be properly cleaned. We use Menno Clean plus in The Netherlands. Ladybirds are the biological control agents.

We use chemical pesticides in The Netherlands, such as Plenum, Tepekki and Flipper. These pesticides should be used intermittently.

Fungus gnats

Fungus gnats can be prevented by not leaving root balls too moist for too long. For biological control yellow sticky traps are being used as well as predatory mites.

Slugs

Some fern species including Aspleniums are very appealing to slugs. To control slugs we use slug pellets in The Netherlands (SluXX of the company Ecostyle).

Caterpillars

Caterpillars can appear in ferns. Scouting for caterpillars is of vital importance. A good measure would be to use a special lamp for insects when the greenhouse is closed. Pesticides such as Nomolt and Runner to control Caterpillars are used in The Netherlands.

Weed

Besides controlling of diseases and pests, controlling of weed is also very important. Make sure that weed is removed immediately, Liverworts/moss may cause problems in ferns. At the time when everything starts to flower (tiny umbrellas grow out of the moss), it will no longer be possible to contain it. Spores spread through the air and start to grow. In The Netherlands we use the pesticide Mogeton to control Liverwort. Please note that this agent leaves a residue on the crop, which is hard to remove.

