



Grower Summary

PO BOF 002b

The National Cut-flower
Trials Centre Programme for
2018 – 2022

Annual 2018

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Project title: The National Cut-flower Trials Centre Programme for 2018 - 2022

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Report: Annual Report (2018)

Previous report: None

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Date project commenced: 01 January 2018

**Date project completed
(or expected completion
date):** 28 February 2023

GROWER SUMMARY

Headline

- A new strain of downy mildew was a serious issue on column stock crops grown in 2018, and ultimately work facilitated by the CFC, culminated in the production of a technical note (CFC/AHDB Information Sheet 11 *Maintaining successful control of downy mildew in protected crops of cut flower column stocks*) outlining future management strategies for the disease.
- Herbicide trials on direct seeded, outdoor Larkspur have identified a new product, HDC H23, to have potential in future programmes, once the herbicide has obtained the relevant approval.
- *Ammi visnaga* and *A. majus* and *Daucus carota*, (ornamental carrot) are in demand, are relatively easy to grow, and should be considered a potential new crop for the UK.
- *Asclepias* varieties are novel and attractive cut flowers with potential for the UK, but the vase life (VL) needs to be verified with additional trials in 2019.
- New varieties of the 'Scoop' series of Scabious show good market potential, however there is a need to consider the cost and method of harvesting to determine the viability of production in the UK.
- The use of different planting and pinching dates was successful in achieving a better continuity of Veronica, but was not successful with all flower colours.

Background

The UK traditionally has a relatively low *per capita* consumption of cut flowers compared with other western European countries, however between 1988 and 2016 imports of cut flowers rose from some £122 m to about £750 m. This increase in consumer spending, combined with the advent of relatively cheap 'Spanish tunnels', to protect crops during production, and environmental demands to cut 'air-miles', should have provided UK cut flower growers with opportunities to expand production. That this did not happen is generally ascribed to a lack of

'know-how' and a culture of buying-in from 'across the water'. (However, Brexit may provide greater opportunities for UK growers such as impacting changes in the sterling exchange rate against both the Dollar and Euro).

The National Cut Flower Trials Centre (CFC) was proposed by industry representatives and subsequently funded by the HDC (now AHDB Horticulture)¹, starting in 2007. Its short-term aim was to provide information on new product development, novel or alternative cut flowers for production outdoors or in tunnels to stimulate UK production.

2018 was the first year of a new funded project and after taking guidance from industry, a new five year programme of work (2018 to 2022) was agreed to broaden the remit of the CFC, addressing a wider range of issues beyond new product development (NPD). Topics addressed in the first year included: ongoing trials examining Fusarium control in column stocks production in conjunction with Warwick University, evaluation of new herbicide products for field-grown crops and reactive trials examining current important industry issues. During 2018 the latter enabled the CFC to quickly investigate the downy mildew outbreak in column stocks, commission sensitivity testing by Fera and recommend a revised spray programme to address the issue of poor control on some nurseries.

Summary

Ammi majus and *A. visnaga*

Seed raised fillers have been of interest to the industry for a few years now and some such as Bupluerum are now grown commercially. However both *Ammi majus* and *A. visnaga* have so far only been adopted by smaller scale 'artisan growers'. The 2018 trial examined continuity of supply with plantings occurring from week 20 through to week 32. As a general observation *A. majus* took six to seven weeks to flower while *A. visnaga* took eight to nine weeks. The 2018 trial clearly demonstrated that continuity can be achieved by sequential planting and that good stem length is possible (except on the week 32 planting). Previous trials have also shown that Ammi can be produced outdoors with adequate irrigation and that outdoor crops tended

¹ Initially with part-funding from the Lincolnshire Fenlands LEADER+ programme

to be more compact and less vigorous, but still produced a marketable stem. Of the two species, *A. visnaga* perhaps has the most potential because the stems are easier to harvest (*A. majus* tends to produce a mass of heads that tangle into each other) and the end product is more compact and manageable. VL tests, on Ammi species in previous trials, found a long (over 10 days) VL with both. Unless the CFC receives any specific request, 2018 will be the last year that Ammi will be trialled, although it is still planned to investigate other fillers from the Umbelliferae family such as *Didiscus*, *Pastinaca* and *Smyrniium*, which will be planted in 2019.

Asclepias (milkweed, silkweed) (varieties of *Asclepias curassavica* and others)
Asclepias is not a commercial crop in the UK, but it is an attractive flower and is grown as a cut flower elsewhere in the world. Grown in a tunnel, the most promising variety in 2018 was *Asclepias curassavica* 'Apollo Orange' which produced prolific and attractive, orange-red inflorescences on long stems over a period of about four weeks. While only two plantings were made in 2018, it would appear that continuity of flowering can be achieved by successive planting dates as the week 20 planting started to flower in week 29 and the week 26 planting started to flower in week 35. Other varieties trialled did not appear suitable owing to either stem length issues, flower bud abortion or problems with the flower quality. Visually, the product has obvious potential, although in both the 2017 and 2018 trials VL was an issue owing to problems with water uptake, and this requires further investigation on the overwintered crop in 2019.

Astrantia major

Astrantia was planted for the first time in 2018 at the CFC with a trial of a new series – 'Sparkling Star' series. The plants will hopefully produce a cut flower crop in 2019 when vase life and market potential will be assessed.

Column stock – late planted variety trial

There has been industry interest in the Japanese varieties of cut flower column stocks for

some time now but there has been very little commercial uptake owing to issues of not being able to select the double flowered seedlings by machine, as is the case with the current widely grown commercial varieties. The double flowered seedlings cannot be selected by leaf colour after a period of cooling, selection currently has to be done based on slight variations in leaf shape and other subtle differences, by a trained expert. Even then, attaining an 85% level of selection is deemed to be an achievement. The hand selection process and the higher than normal percentage of singles make these an expensive crop to produce and there has to be a significant commercial advantage in their production.

One such advantage could be the ability to extend the season of the flowering crop into the summer months when it has been reported that the Japanese varieties are less prone to flower initiation problems at higher temperatures. To investigate this further, a range of Japanese varieties including 'Arrow', 'Avalon', 'Cheerful', 'Iron', 'Noble' and 'Venus' along with the traditional varieties of 'Anytime' and 'Mathilda' were planted in week 29. The 2018 season, with long periods of temperatures in excess of 30°C, tested the varieties and showed that while there were issues with flowering, most of the Japanese varieties did initiate a bud and started flowering in week 36. The 'Mathilda' series initiated no flowers at all and the more resilient 'Anytime' series showed erratic initiation with very few marketable stems.

Unfortunately despite initiating flowers, a number of the flowers spikes on the Japanese varieties were either distorted or too short leading to only 15 to 25% of stems being marketable. Those that did reach a marketable state produced very strong flower stems, in excess of 60 cm in length, which generated sufficient confidence to investigate them further in 2019. It is proposed that four plantings will be made in weeks 18, 20, 22 and 24 to determine how they perform in less challenging conditions, when the temperature should not be as extreme as those experienced by the 2018 trial, to see if a premium priced product can be generated.

Daucus carota

Small plots of Daucus carota 'Dara' have been planted and grown at the CFC in previous

years. Only a small number of stems were produced from these earlier trials but they did generate some industry interest. In order to try and determine the true commercial potential of *Daucus*, plugs were sourced from *Florensis* in 2018 and a number of successional plantings were made from week 20 to week 32. Similar to the *Ammi majus* trial, the crop took about six to seven weeks from planting to flower and the week 32 planting produced stems that were too short to be marketable. The trial generated interest both at the CFC Open Day and also through samples taken by, or sent to, the industry throughout the season.

One of the potential disadvantages of the crop as a supermarket product could be the wide range of flower head colours and sizes produced which would make it difficult to meet a specific specification. However, if this could be overcome by perhaps using *Daucus* in a more flexible bouquet specification, it could have real potential as a new product for UK growers. It is already widely grown and used by 'artisan growers'. The crop appears as if it can be harvested at a wide range of maturities, but post-harvest work would need to be undertaken to determine the optimum maturity stage to maximise VL.

Echinacea (coneflower) (varieties of *Echinacea purpurea* and others)
Echinacea is not known as a commercial cut flower crop in the UK, but it makes a colourful cut flower, offered in other countries. A large variety trial is currently underway at RHS Wisley (2016 to 2020) and when viewed by the Project Manager in 2018, it was evident that a number of the varieties had potential as cut flowers. In order to assess this potential, a number of varieties were planted in late 2018 for assessment in 2019.

Eucomis autumnalis
Eucomis was planted at the CFC in previous years using plants grown from seed and propagated on site. However, the seedlings failed to make a marketable crop before the tunnel had to be cleared. As the crop had previously been identified as having potential as a cut flower, a new trial was planted in 2018 using both (large) corms, planted in week 20 and home propagated seedlings planted in week 26. During 2018, only a percentage of the corms produced a flower stem (starting in week 29) with the seedlings growing very slowly and only producing a small plant by the end of the season. While not enough stems were produced to

assess the crops' true market potential, some of the flowers were used in floral displays such as at Leeds Castle, Kent and anecdotal reports indicated a good vase life. Further assessments will be made in 2019.

Lysimachia fortunei

While *Lysimachia* is not currently grown commercially in the UK, there are a number of cut flower varieties listed on the Dutch auction, including 'Abraham', 'Elisabeth', 'Jumbo', 'Mambo', 'Marilyn' and 'Martha'. The *Lysimachia* trial was requested by growers who viewed the previous CFC Veronica trial in 2017, owing to the similarity of their flower forms. Of the two varieties supplied to the CFC in 2018 (and planted in week 21), 'Jumbo' performed the best, as 'Mambo' suffered from severe chlorosis and necrosis of the leaves. The reason for this problem remains unidentified and it is not known if other varieties would show a similar problem if grown in the same soil type.

The long, strong stems which started flowering in week 31, generated industry interest, especially for use in floral displays, but there was a query about whether the curved nature of the flower stem would be suited for use in supermarket bouquets, although this was one of its attributes most loved by the floral designers who used samples of the CFC product. Other varieties such as 'Marilyn' may produce straighter flower stems. The performance of the second year crop will be assessed in 2019 and additional VL work will be undertaken.

Scabious (varieties of *Scabiosa atropurpurea* and *S. caucasica*)

Scabious are mainly known in the UK as herbaceous perennial plants. In 2016, the CFC was offered a range of new varieties from Danziger (the 'Scoop' series) and HilverdaKooji. Both series had an attractive range of flower colours, high yields and good VL, and were well received by the industry, having good potential for use by retailers in mixed bouquets. In 2018, the Scoop series was examined again owing to the fact that a large number of new varieties had been introduced. Some of these new introductions were well received by the industry especially 'Red Velvet' which has a vibrant coloured bloom held on strong and long stems. The trial was planted in week 18 and the first flowers were harvested in week 28. The crop then flushed very heavily through the very hot period at the end of July and into August.

However, the hot weather seemed to 'exhaust' the plants and by mid-August only a small number of weak stems were being generated and this was mirrored by other trial crops in the UK and also commercial crops in the Netherlands. A decision was therefore taken to cut back half of each bed with some varieties being cut back to the ground and others cut back to about 50 cm. By mid-September the varieties that were cut back to 50 cm were producing a second strong flush of flowers but those that were cut back to the ground took a further two weeks to regenerate. (Note it was not necessary to cut back the plants in trials staged in 2016 and 2017 which did not have to endure same temperatures).

As with previous years, the cost of harvesting was an issue, but in 2018 it was decided to harvest at 50 or 55 cm stem length and leave the side shoots as part of the stem. This served to both speed up the cost of harvest and also produced a bulkier bunch of flowers. It had been decided that 2018 would be the final year that Scabious would be trialled, but towards the end of the season one of the CFC management group members, who also hosted trials, received requests from local packers (whom had been importing stems from the Netherlands) to investigate the crop further during 2019. As a consequence, a range of varieties from both Danziger and HilverdaKoji will be planted in 2019 along with parallel trials on growers nurseries.

Veronica longifolia

The 'Spark' series of Veronica featured in earlier trials, but at the time its lightweight stems and restricted production window made it unlikely to be economic to grow in the UK. Following renewed interest in this crop (and fillers in general), plots of the new 'Skyler' series were trialled in 2016. When grown in a tunnel, flowering was prolific, with straight stems and well coloured flowers, and overwintered plants produced two flushes the following year. However, because the window of production was still relatively short it was recognised that seasonal extension would need to be investigated (via scheduling and plant pinching) to gain the interest of growers. The 2018 trial showed that with the 'Skyler' series, both different planting dates and pinching dates were successful in extending the season of the pink and white flowered varieties, but for the blue flowered variety only the planting date had any effect. At this stage

it is not known if the blue flowered varieties of other Veronica series behave in the same way as the 'Skyler' series. The 2018 crop will be overwintered in order to both provide samples for the industry and to undertake further VL tests, because even though there is anecdotal evidence that samples taken by the industry in 2018 had a good vase life, no data was obtained via a recognised VL facility. It is not anticipated that any new plantings of Veronica will be undertaken by the CFC.

The new five year CFC project has allocated an annual percentage of the overall funds to enable work to be undertaken on important current industry issues. In 2018 these funds were used to address issues concerning downy mildew control on column stocks (*Matthiola incana*) and enabled the problem to be actioned quickly. Column stocks are currently the main non-bulb, protected UK cut flower crop with around 18 million stems being grown in 2018. Downy mildew (*Peronospora parasitica*) has always been a disease associated with column stocks but was generally prevented or easily controlled by a regular spray programme using a few fungicides, including products that contain metalaxyl-M. However, in early 2018 crops grown in the Netherlands suffered from a very severe infection of the disease which was not controlled by standard spray programmes. In mid-May, problems with disease control were reported on UK column stock crops, with a number of larger businesses reporting problems over the same weekend. Despite adoption of the usual range of fungicide products, growers found that the disease was causing severe crop damage with infections appearing almost overnight. Even a reduction in the spray interval did not appear to control the disease.

With the help of the CFC and an independent industry consultant, growers then radically modified their spray programmes in terms of introducing new fungicide active ingredients and also reducing the interval between spray applications. Even these measures did not totally eliminate the problem, and many businesses found that they had some level of crop infection right to the end of the 2018 season. It was clear that this was a new highly aggressive strain of downy mildew and that further investigation was required.

After a CFC organised meeting at the end of June, it was agreed by the industry that a number of fungicides should be subjected to sensitivity testing using a number of different isolates of downy mildew gathered from different nurseries. Samples were collected from a total of five nurseries, one in Northern Ireland, one in Cornwall, two in Norfolk and one in Lincolnshire, representing a wide geographic spread within the UK. The samples were inoculated by Fera onto fresh column stocks seedlings to build up inoculum before undertaking the sensitivity testing.

The results of the sensitivity testing showed that at the fungicide rates used, none of the products applied gave 100% control of all five downy mildew isolates. The greatest level of control was achieved from the application of Paraat (dimethomorph), where 90% control or greater was achieved for three of the five isolates. Percos (ametoctradin + dimethomorph) was the second most effective product with greater than 80% control achieved for three of the five isolates. In the case of both fungicides it was the isolates collected from Ireland and Norfolk which showed most 'tolerance'. The only other product to give any significant level of control was Revus (mandipropamid), where greater than 70% control was achieved for three of the five isolates. Very limited control was achieved following the application of HDC F253, Signum (boscalid + pyraclostrobin) and Subdue (metalaxyl-M).

Products containing metalaxyl-M would normally be expected to give very good control of downy mildew pathogens. The lack of any control by Subdue, and only partial control by Fubol Gold (mancozeb + metalaxyl-M), suggests that all five isolates were tolerant/resistant to metalaxyl-M. The improved level of control achieved by Fubol Gold was assumed to be a result of mancozeb in the formulation.

The results of these trials have been used to produce a detailed technical note entitled CFC/AHDB Information Sheet 11 '*Maintaining successful control of downy mildew in protected crops of cut flower column stocks*'. This can be downloaded from either the CFC or AHDB websites.

Column stocks - improving control of Fusarium wilt

Column stocks are a mainstay of glasshouse cut flower production in the UK. In 2017, as part of a new AHDB funded project on *Fusarium oxysporum* control in horticultural crops, an area sufficiently infested with *F. oxysporum* was needed as an experimental site for trials and was set up at the CFC in the tunnel previously used for column stocks trials. The soil was infected with *F. oxysporum* f. sp. *mathioli* culture and one day later the tunnel was planted with plug-plants of a range of column stocks varieties, together with Lisianthus and Brassica plants, included for checking the host-specificity of the Fusarium culture. The 2017 trial demonstrated that the soil in the tunnel had an apparently even spread of pathogenic fungus throughout it.

In 2018, a fully replicated variety trial was planted in the tunnel using most of the currently available commercial column stocks varieties grown in the UK as well as a few plots of Lisianthus. The purpose of the trial was to update the previous data obtained from a similar trial undertaken at J A Collison & Sons in 2015 by including varieties introduced since that date, such as 'Mathilda'. However, the trial was late planted (in order to try and tie in the results with the CFC August Open Day), which meant that the plants were exposed to the heat wave experienced during July and August. The result of this was that plants in most of the plots expressed a severe level of Fusarium within three to four weeks of planting and it was therefore not possible to identify any subtle differences in Fusarium susceptibility between the different varieties. Despite this, the trial did serve to demonstrate the species specificity of Fusarium, not a single Lisianthus plant succumbed to Fusarium despite the massive disease pressure that was present in the trial.

Herbicides for outdoor Larkspur

In conjunction with ADAS, a fully replicated trial was undertaken to investigate nine different herbicide combinations on a direct seeded crop of outdoor larkspur sown in week 22.

Assessments were made throughout the growing period of the crop.

Although emergence of the Larkspur across the trial was variable, it was possible to identify some differences between the treatments. In terms of crop emergence, HDC H23 pre-sowing followed by Defy (prosulfocarb) 4 L/ha post-sowing gave the highest number of

germinated seedlings per 1.5 m row, and also had the lowest weed cover (8.3%), which suggests that this is a promising treatment.

HDC H23 pre-sowing, followed by Defy 3 L/ha (T3), Dual Gold (s-metolachlor) 0.78 L/ha + Gamit 36 CS (clomazone) 0.25 L/ha and Stomp Aqua (pendimethalin) 2 L/ha + Gamit 36 CS 0.25 L/ha also gave reasonable weed control, and crop emergence was similar to the untreated control, which suggests that these treatments may also be suited to Larkspur production. The lowest emergence rate was seen in plots treated with Stomp 2 L/ha + Defy 4 L/ha, and this reflects the results from the previous trial in 2015.

Stomp Aqua 1.5 L/ha + Gamit 36 CS 0.15 L/ha did not give particularly good weed control at this lower rate, and neither did metobromuron, although crop emergence was not reduced. It is likely that metobromuron would need to be mixed with another herbicide product in order to achieve sufficient levels of weed control.

Lily - alternatives to peat-based growing media

The production of cut flower lilies from bulbs imported into the UK has been very successful, and the product remains hugely popular with customers. To avoid soil-borne pathogens, bulbs are grown in crates of peat growing medium, and so there is interest in finding alternatives or diluents for peat. Over 2013–2017 alternative media including: coir, cocopeat, wood fibre, 'Forest Gold', green-waste (GW), green compost and aerobic digestate (AD) and various mixes - were compared with a typical peat-based lily medium ('peat').

The 2018 trial continued this work, investigating a 30% peat-reduced mix and a peat-free mix as well as a reduced volume per crate of a standard grower mix. Statistically, in terms of stem weight and length there was no difference between any of the mixes trialled in 2018. However, visually there was a large difference between the peat-free mix when compared to the other mixes as regards leaf size and colour, with the peat-free mix producing both smaller and paler leaves to the extent that the crop would have been unmarketable. Clearly more work is needed on the formulation or the nutritional needs of the crop when using such a mix.

Zinnia and Dahlia (vase life improvements)

Applications of the high calcium water soluble fertiliser Calmax during production had no effect on stem strength and vase life of Zinnia and no impact on vase life of Dahlia.

Financial Benefits

This is the first year of a new five year project and as such any financial benefits reported will not take into account the potential £2.5 million of new product trialled and facilitated by previous CFC trials. More so as it is the first year of the trial none of the new products examined will yet be in production so it is not possible to give a financial value for this aspect of the project in 2018.

The main financial benefit to the industry from the 2018 CFC project has been from the work on downy mildew in column stocks. While it is impossible to put an exact figure on the savings, it is known that in the Netherlands many hundreds of thousands of stems of column stocks were lost as a result of the disease. The UK grows about 18 million stems of column stocks annually which at an average of 24 p per stem makes a total industry value of around £4.3 m. If as a conservative estimate, the CFC project reduced crop losses by 10% this would represent a saving of £430,000 in 2018 alone. As an example, one grower initially found the problem in a glasshouse containing 600,000 plug plants, and taking into account the speed of infection, there was concern that without the necessary amendment to the spray programme at least 50% of the crop would have been lost, resulting in a loss of around £72,000 in that glasshouse alone.

The potential new herbicide programmes identified by the 2018 Larkspur herbicide trials will ultimately represent a financial gain to the growers in terms of labour saving, but this cannot be realised until HDC H23 obtains the relevant approval.

Action Points

The following should be considered within future crop planning:

- Production of *Asclepias*, *Lysimachia*, *Scabious* and *Veronica* could be suitable novel, niche ventures for UK cut flower growers.
- *Ammi visnaga*, *A. majus*, *Daucus carota* 'Dara' (ornamental carrot) are potentially economic, direct-drilled fillers for production in polythene tunnels or outside.
- As an alternative to production of box-grown lilies in a peat-based medium, trials over the past five years have shown that production in peat + aerobic digestate gives cut flower lilies of equal quality while reducing peat use, but care should be exercised when using anaerobic digestate until a standard specification is available. Peat + wood fibre or peat + cocopeat mixtures are also effective. Lily growers should follow the debate and developments regarding the use of peat-free and peat-reduced growing media.
- Column stock growers should be aware of the threat of the new strain of downy mildew, and obtain a copy of the recent AHDB / CFC Information Sheet 11 *Maintaining successful control of downy mildew in protected crops of cut flower column stocks*.
- Larkspur growers should consider how the various herbicide programmes examined in the 2018 trial can be applied to their own individual business and keep up to date with the progress of the coded product HDC H23.