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HORT4141W

Review Paper Phase 3

10MAY2020

The Mysterious *Meconopsis* 'Lingholm'- The Himalayan Blue Poppy for the Cut Flower Industry

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10 MAY 2020

Executive summary: The lineage and potential commercial uses of the Himalayan Blue Poppy 'Lingholm' are detailed in this paper. A literature review of 'Lingholm', its known growing conditions, close relatives (*Meconopsis* spp) native to Nepal and Bhutan, cultivated relatives in the "Fertile Blue Group' of Himalayan poppies in the West, and 'Lingholm's' taxonomy and characteristics related to them are mapped out. Much misidentification of 'Lingholm' and its relatives have crept into gardens in the past, and its taxonomic description, along with close relatives 'Slieve Donard', *M. baileyi,* and *M. grandis* are detailed. 'Lingholm' is a striking blue poppy that is suitable for outdoor growth in limited cool-temperate environments, however, it requires a narrow set of growth parameters that many of the home or display gardens of the world can't reproduce. Since this flower has exceptional looks and also large amounts of viable seed that some of its other cultivated relatives don't have, the potential for this flower to enter the cut flower market is higher than others from the *Meconopsis* genus. Other *Meconopsis* have similar looks and growth habit, but must be propagated by division, reducing the chances to enter the cut market substantially. The hypothetical introduction to the horticultural production chain is discussed and a preliminary product information guide is constructed herein, although this flower yet needs substantial research concerning precise photoperiods, plant growth regulators (PGRs), programmability, harvesting and handling, and post-harvest storage. Once this research is finalized, the flower may have the opportunity to be a cold-season crop in greenhouses in northern latitudes, which can boost grower incomes as it requires cooler temperatures for much of its growth period, necessitating lower energy costs. This flower has the opportunity to become a high-end addition to many existing spring holidays, or to capture the market on spring holidays that don't yet have associated flowers, due to its unique look and color.

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Figure 1. 'Lingholm' Photo credit: Meconopsis.org

I. Introduction

A. *Meconopsis* ‘Lingholm’

1. Taxonomic Classification and Geographic Distribution in the Wild

Taxonomic Classification- The taxonomic classification of *Meconopsis* ‘Lingholm’ is a mysterious one. ‘Lingholm’ is in the Papaveraceae Family, Genus *Meconopsis* Vig., Subgenus *Grandes*, Series *Grandes* Prain, Cultivar: ‘Lingholm’ (Figure 1), with the synonyms: *Meconopsis* x *sheldonii* and *Meconopsis grandis*, and the common name Himalayan Blue Poppy (Grey-Wilson 2014). The exact species for ‘Lingholm’ is debatable, as records of plant types and breeding in private gardens in the heyday of importation of the plants was almost non-existent. Based on import timing and morphology studies (Meconopsis Group 2020), the suspected hybridization to make ‘Lingholm’ was probably *M. baileyi* x *M. grandis subsp. grandis,* which gave rise to the sterile *M.* x *sheldonii* in 1934 in Surrey, England by W.G. Sheldon. From *M.* x *sheldonii* arose the cultivar 'Slieve Donard', and some postulate that ‘Lingholm’ (Figure 2) was a spontaneous mutation from 'Slieve Donard' (Figure 3), due to flower and rosette morphological similarities which was discovered by Mike Swift in Lingholm Estate at Cumbria, England in the early 1960s (Jenkins 2005).

‘Lingholm’ was notable not only for its vibrant sky blue color but its seed viability and is one of the few *Meconopsis* hybrids that is fertile. Unfortunately, since the parentage is triploid and therefore ‘Lingholm’ is allohexaploid, geneticists will have great difficulty in pulling apart the precise lineages (Grey-Wilson 2014).

Figure 2. 'Lingholm' Photo credit: Meconopsis.org

Figure 3. 'Slieve Donard' Photo credit: Meconopsis.org

Meconopsis grandis was discovered by western botanists in Nepal in 1881-1892 and was described by Sir David Prain in Jongri District, Sikkim state, India. Prain brought *M. grandis* to the Royal Botanic Garden Edinburgh in 1895 (Prain 1906). M*econopsis grandis* subsp *grandis* was first brought to western cultivation in 1932 and Luddlow and Sherriff brought the subspecies *orientalis* to the west in 1933 from Bhutan (Grey-Wilson 2014).

In 1915, after the 1913 expedition of Colonel F.M. Bailey into Xizang, Tibet, Sir David Prain described the likely other parent, *M. baileyi,* from a partial specimen. Frank Kingdon Ward better described *M. baileyi* in 1924 while in the same area as the 1915 expedition (Grey-Wilson 2014). *M. baileyi* seed was sent all around to the UK, the US, Canada, and New Zealand in 1924-1926, and as such, is one of the most common forms, along with 'Lingholm', in cultivation. It was noted that it grew like a weed in Royal Botanical Garden Kew, England, and is very common in its native range (Grey-Wilson 2014). For decades, there was discussion about whether *baileyi* from the Tibet area and *M. betonicifolia* from Yunnan, China area were the same species, until the 2010s, when it was determined that they were, in fact, separate species (Grey-Wilson 2014).

Since the exact lineage of ‘Lingholm’ is unknown, a general “Fertile Blue Group" was created, in which ‘Lingholm’ is a member. Members of the “Fertile Blue Group” are fertile, large-flowering perennial blue hybrids (Meconopsis Group 2020). The original non-fertile hybrids brought to western gardens had to be divided for propagation, but members of the “Fertile Blue Group” could dehisce fertile seed, which allowed them to spread around the west much easier and later into the century than their sterile counterparts. ‘Lingholm’ and other members of the “Fertile Blue Group” have been inaccurately called *M.* x *sheldonii, M. grandis, M. baileyi,* and *M. betonicifolia* (a closely related species not in the immediate range of *M. grandis* and *baileyi*), along with the frustratingly broad blue poppy, Himalayan poppy, or Himalayan blue poppy (Meconopsis Group 2020). Altogether, similar morphologies, inattention to seeding ability, and lack of genetic record of the original imports are the primary reasons for ‘Lingholm’s’ lack of taxonomic clarity.

Figure 2, 'Lingholm' form
Photo Credit: Meconopsis.org

Taxonomic Description- ‘Lingholm’ - The overall form is a clumping herbaceous perennial, 80-120cm tall while in flower (Figure 4). Roots are fibrous and the plant overwinters as a cluster of buds at ground level atop the fibrous remains of the leaves of the previous seasons. The stem is erect and 10-40cm long, covered in short hairs and usually has 1 or 2 cauline leaves, from which the 1-5 ovoid buds emerge (Grey-Wilson 2014).

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Flowers are 4-petaled, which occasionally overlap, are sky-blue in color (lacking pink and purples), and are broadly oval with a 10cm diameter. Flowers are

outward or down-facing, which eventually point upwards upon fruit capsule formation, with protruding ovary, style, and stigma which are ringed by yellow to yellow-orange stamens. The style is thin and about 1cm long and can gradually or abruptly merge with the stigma. The fruit capsule is oblong to elliptical, about 3-5cm long by 1cm wide, full looking, and is completely covered by 4mm barballete bristles. The seeds are black to dark gray with pits on the surface, giving them a dull tone. Seeds are kidney shaped and about 1mm wide by 2-3mm long (Grey-Wilson 2014).

New leaf shapes can be variable (Figure 5), but usually emerge in a rosette on short petioles, and are lanceolate and narrow, standing straight upright. Young leaves are concave, can have a split at the leaf tip, and have an abundance of long, soft hairs, with the upper leaf side hairs being longer than the lower side. The color of the hairs is dark brown at the base and fading nearing the tip. When the lower and cauline leaves mature, the soft hair becomes coarse and bristly, but the overall leaf shape still retains its concavity. Margins can range from entire to shallow undulate, to deeply serrate, with much variation in shape and depth. When mature, the leaves remain upright or can drop to a 45-degree tilt (Grey-Wilson 2014).

Figure 3, Various 'Lingholm' leaf forms Photo Credit: Meconopsis.org

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Late May to Early June is the flowering period in the UK. (Jenkins 2005, Meconopsis Group 2007, Grey-Wilson 2014)

Meconopsis grandis differences from 'Lingholm' include being very barbellate bristly, as opposed to hairy or glabrous. The leaf shape and margins are generally more regular and the

upper 3-5 cauline leaves are set into a false whorl. Sometimes several buds can be found emanating from the cauline leaf bases. Flowers have 4-9 petals that range from pale to deep blue, wine purple, mauve, and pink. *M. grandis* can sometimes be shortly rhizomatous. *M. grandis* is tetraploid with a chromosome complement of 2n=4x=164. Blooms are found in June to early August in its native range (Meconopsis Group 2007, Grey-Wilson 2014).

Meconopsis baileyi differs from 'Lingholm' with- 1-6 stems with subumbulate inflorescence, and, up to six flowers. It is generally glabrous versus barbellate or hairy, with longer leaves that are more crenate than serrate. *M. baileyi* is diploid with a chromosome complement of 2n=2x=82 (Meconopsis Group 2007, Grey-Wilson 2014).

Geographic Distribution in the Wild

'Lingholm' can only be found in cultivation and not in any ancestral range. It is planted in cool, moist summer environments, is said to be hardy from USDA zones 3-6, and can be found in the northern UK, the northern coasts of the US, moving up into Canada, and southern coastal Alaska, southern Scandinavia, and New Zealand. It is one of the only hybrid *Meconopsis* in cultivation that has the potential for being invasive due to its fertile seeds, but the environment must be very refined for this to happen. It has not been reported to become invasive in the Pacific Northwest, the Northeast Atlantic, Alaska, Scandinavia, or the UK. As for the probable forbearers of 'Lingholm', *M. grandis* subsp *grandis* is found in patches from west Nepal stretching all the way to eastern Bhutan (Figure 6), with a range

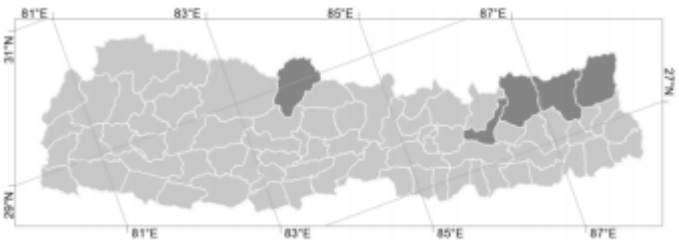

Figure 4, *M. grandis* subsp *grandis* in Nepal Photo credit: RBG, Edinburgh

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totaling about 800 miles long. The altitude is about 3,000-4,420m, and the plant grows in rough, rocky meadows, woodland margins, stream sides, shrubberies, and rhododendron woodland edges. *M. baileyi* range stretches from Arunachal Pradesh on the northeast Indian border with southeast Xizang, Tibet. Its altitude is 2896-3810m, and grows in mixed forests, glades, woodland edges, and rough, rocky meadows. *M. baileyi* and *M. grandis* are not close enough in native ranges (not sympatric) to interbreed but easily hybridize in cultivation, furthering the thought that they are the progenitors of *M.* x*sheldonii* and 'Lingholm' (Grey-Wilson 2014).

The climate of the eastern Himalayas where *M. baileyi* and *grandis* grow is a moist alpine ecosystem. June to September monsoons help keep *Meconopsis* thriving with water and higher temperatures during the growing season, and when there is no regular rain, there is regular fog. Annual rainfall for the southern areas has reached 500cm, and snowmelt can add to moisture levels. The temperature rarely breaks 28°C, with the yearly average temp of 18°C. Winters in the area can have temperatures drop below 0°C nightly, and the snowline is around 4800m. (Sikkim Tourism 2017)

Indigenous use: *M. grandis* has been found around shepherd dwellings, where it is cultivated for oil extraction from seeds. *M. grandis* subsp *grandis* has its seeds roasted and pickled for consumption (Grey-Wilson 2014), and flowers and entire plants are an important fever reducer and treatment for hepatitis, pneumonia, liver heat, lung heat, and fractures (Luo 2002).

II. Crop Species

A. History and Potential Uses

1. Production Information

‘Lingholm’ seed is only found on the market in small quantities, as the price of the seed is near 7,500 British pounds or 9,287 U.S. dollars per kg (Jenkins 2007). Most other *Meconopsis* hybrids need to be divided for propagation, so while the price may be high for seed, it is still one of the more cost-efficient ways to produce large amounts of plants. Similar seed found on the market are *M. baileyi, M. grandis, M. horridula,* and M. *betonicifolia*, for wild plant types, and x *sheldonii* and ‘Slieve Donard’ as cultivars. ‘Lingholm’ has the most stable blue color, ease of growth, and perenniality, compared to the related species and cultivars (Steininger 2011, Yan Qu, et al. 2019, Meconopsis Group 2019).

Groups that are breeding and conducting testing on ‘Lingholm’ are The Meconopsis Group, a coalition of professional and amateur gardeners and breeders, public gardens like the Royal Botanic Garden (RBG) Edinburgh, RBG Kew, Longwood Gardens, and Lingholm Gardens, and specialized producers and growers like Kevock Garden Plants in Scotland and Wilderness Nursery in Alaska.

The current production chain for ‘Lingholm’ is set to a small scale, as the requirements for growing the plants necessitate very precise environmental conditions (Figures 7 and 8). Greenhouses or hoop-houses in cool-temperate areas could offer some of those environmental conditions to growers, but with such a large growth habit, sufficient space to grow large numbers may be difficult to come by in enclosed environments. Even with the potential growing difficulties, interviews with wholesale florists have indicated that sales could be high, as the color and long stems are very sought after for the cut flower market (Koehler and Dramm 2020). In order to increase production of ‘Lingholm’, some links in the production chain would have to expand capabilities, such as increased bench numbers, different soil mixes, and cooler summer temperatures than what is ordinary across much of the world if greenhouses were to be used in

areas where the natural climate is unsuitable. Barring greenhouse production, limited locations across the world could handle growing under those conditions in an open field.

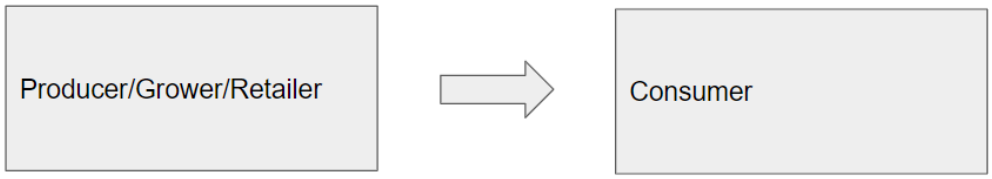

Figure 5. Current production chain- Current 'Lingholm' production takes advantage of viable seed to produce far more plants that what division can offer. Most are grown as display plants by public gardens, private breeding groups, or specialized, small-scale producers/growers/retailer of rare/specialized plants. These groups will often sell extra seed when available.

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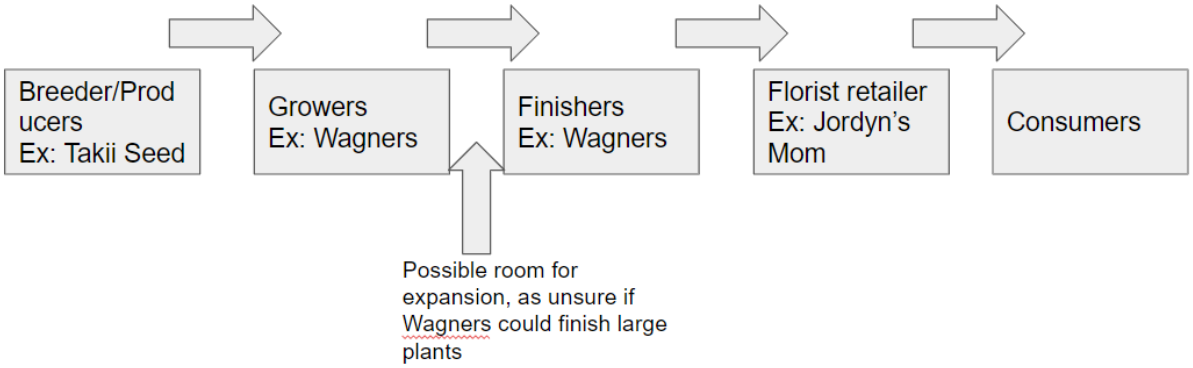

Figure 6. Potential future production chain- If 'Lingholm' were to enter the cut flower market, vast expansion of growing habitat or shifting of crops would need to occur in the Pacific North West, the Atlantic North East, along Lake Superior, or in greenhouses above the zone 6 latitudes.

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III. Production Information

A. Anticipated Cultural Requirements

The life cycle of ‘Lingholm’ and its relatives is that of a short-lived perennial in cool-temperate cultivated gardens and the wild. The species produces prodigious amounts of seed and after years with heavy seed production or poor climactic conditions, may die (Meconopsis Group 2007). Every year, ‘Lingholm’ and close relatives send up new leaves after snowmelt or a period of at least 12 weeks of vernalization (depending on climate and environment), followed shortly after by a flower stalk, which can bloom for up to four weeks (Gercens 2011). In British Columbia, field-planted ‘Lingholm’ starts to flower from late May to early June (Yan Qu 2019). If the flower is pollinated, the seed capsule forms and dries by late-summer and can either hold seed in the capsule until the following spring, or break open after drying and dehisce seed at that point. Seed needs at least 30 days of cold stratification for proper germination. If seed drops early, there is a chance that some germination could occur, and if early enough, the seedlings may be strong enough to survive winter dormancy of around 0°C.

Mature plants die back to the ground when killing frosts arrive, and survive the winter as dormant buds at ground level amongst leaf litter (Grey-Wilson 2014). Winter hardiness has been shown to be from USDA Zone 3-6, although zone 3 may be a gamble when growing outside, and would require considerable mulching and protection from drying, cold winds (Longwoods Gardens 2020).

Another concern is summer temperatures and light. Temperatures from 18.3°C to 21.1°C have been shown to induce stress on the plant, while sustained temperatures above 21.1°C can kill above ground foliage or the entire plant if not grown in cool, moist soil (Steininger 2011). An American Horticultural Society heat zone of 1-2 is acceptable, while heat zone 3 is on the edge of ‘Lingholm’ being an annual. More than three hours of direct light in high heat is also a concern, which can scorch foliage.

‘Lingholm’ would most likely be best suited for the cut flower industry, due to its highly prized blue color and long stems. In some climates, it would also be a phenomenal woodland garden plant, as it does well in part shade and has a width of up to a meter. Since ‘Lingholm’ is open pollinated, seed strain differences can be observed in stressful conditions also, such as overall plant vigor, flowering time, and pigmentation differences. Mauve coloration can occur from a number of different effects, such as gene expression due to pH and fertilizer changes, mechanical damage and water stress in the bud stage, and cold stress in the cracking to blooming stages (Steininger 2011, Yan Qu 2019).

In the potential production environment, it must be determined if the natural environment and climate is suitable for growing ‘Lingholm’ or if protected environments must be utilized. Since the natural climate for most *Meconopsis* is between 7.2°C to 15.5°C in the growing season, and slightly below 0°C in the dormant winter, field production would be limited to coastal areas protected from salt spray, above 40° North latitude, or specific local inland climates, such as the North Shore of Lake Superior. These coastal locations are suited for growing ‘Lingholm’, as these areas keep the climate at a moderate temperature during all seasons. Mountain elevations between 2,800-3,800 m could also be utilized, assuming they have proper yearly precipitation, rich soil, and appropriate temperatures, although farm land at these locations may be difficult to find. Outdoor growers could purchase one year crowns or start by seed. Wood-edge gardens and moist, shaded beds would allow for partial sun and protection from cold, drying winds. Soil would require heavy organic matter amendments and mulching, such as garden compost or manure, or 35g per sq. m of 20-20-20 slow release fertilizer in the spring (RHS 2019). Digging

down 18", adding compost to existing soil, and topping with fine bark mulch, along with a slow-release fertilizer to the top 3-6" is necessary for the heavy feeding requirements of 'Lingholm' (Rhododendron Species Botanical Garden 2020).

According to the Royal Horticultural Society (2019), fresh seed is necessary that has been cold stratified (near 0°C) for a minimum of 30 days, but up to 90 days, as it quickly loses viability. Sowing on two parts peat-free compost to one part perlite is ideal in order to retain moisture. Seed needs light to germinate, so top sewing is necessary, and a light top dressing of fine perlite anchors the seed. Germination should occur after three to four weeks (RHS 2019). Sewing should take place in late summer/early autumn and seedlings can be overwintered in a cold frame or started indoors and transplanted upon proper temperature in the spring. Seed should be sown in groups of four to five, and when the first pair of true leaves appear, the group should be transplanted to pots together, so as to not disturb the delicate roots, however losses are undoubtedly going to occur (RHS 2019). Seedlings should be fertilized every two weeks during the first growing season (RHS 2019).

If appropriate outdoor locations are not available to a grower, protected artificial environments may be the only other option. Some current growers receive one year old crowns in northern continental US states to grow and finish in greenhouses, which were started by Stanley Ashmore, one of the few major exotic seed producers in Alaska (Steininger 2011). The crowns are planted from seed in Alaska, grown to frost in the first year to induce dormancy, and then harvested and shipped in October. Dormancy must be ensured, as storing when still green can garner losses of 50 percent. Upon arrival to the grower, all foliage is removed to prevent gray mold, and then

potted in 4x4x10”square pots in 60/40 coarse peat moss and perlite mixes, with 5.7-6.2 pH. The root ball should be covered up to, but not over, the crown and watered in (Steininger 2011). *Papaveraceae* in general are subject to rot, so it is very important to not cover the crown, and also to not jostle the roots, as they are very delicate. After potting, they are placed in a cooler at 1-2°C for a 12 week vernalization (Steininger 2011). It is debatable if repotting into fiber pots is necessary, but could be helpful in drainage and protecting from rot. It has been reported that since the roots are so delicate, between 5 and 10 percent losses can be experienced during repotting. After being removed from dormancy, ‘Lingholm’ can be forced to flower by 7.2°C days and 10°C nights, with an average forcing time of 60 days. If crowns arrived to the grower in October, then the start of blooming should begin late February and peak in early March (Steininger 2011). Pots should never be allowed to dry, fertigated two or three times per week with 20-20-20 acidifying fertilizer, and flushed on weekends. Supplemental light is not required but very beneficial during the winter, with plant size doubling with an 18 hour photoperiod, although more research should be conducted on flower bud initiation and precise photoperiod (Steininger 2011). As the mature plants can have a spread of 1m, sufficient pot size and bench space should be assured.

As some *Meconopsis* die after heavy seed production or stressful climatic conditions, pinching back all flower buds (dead heading) during the first year is advisable, so the plant can gain sufficient strength to handle the stress of seed production (Rhododendron Species Botanical Garden 2020). There is little information about Plant Growth Regulators (PGRs) on ‘Lingholm’ at this point, and further research should be conducted. In other poppy production, it has been shown that 576g a.i./ha of ethephon reduced lodging in *Papaver somniferum*. This would likely

not be used regularly for cut flower production, at the longer stems would be preferable for arrangements, although may be necessary under windy growing conditions (Spitzer and Bilovsky 2017).

In terms of pest and disease management, damping off is a problem with the tiny seedlings, and like all poppies, powdery mildew is a problem especially if the plant is too dry (RHS 2019), and further testing should be conducted as to the best applications of fungicides. If planted outside, slugs can eat entire young plants (Rhododendron Species Botanical Garden 2020), and mealybugs can attack throughout the growing season (RHS 2019).

Some organizations that produce seed or sell divisions are listed below

Organization	Location	Notes
Rhododendron Species Botanical Garden	Washington	https://rhodygarden.org/shop/order-plantsseeds/
Kevock Garden	Scotland	https://www.kevockgarden.co.uk/plantlist/plant.asp?SKU=MLA&PlantName=Meconopsis_%27Lingholm%27_(Fertile_Blue_Group)&PlantorBulb=Plants
Meconopsis.org	International	http://www.meconopsis.org/pages/seedexchange.html
The Blue Poppy	Alaska	Wholesale

Table 1. 'Lingholm' producers across the globe where the product is currently available (as of 2020).

B. Market Niche

As 'Lingholm' is so difficult for perennial yard growth except for a very few specific environments, the cut flower market may seem the most profitable. The long stems and highly sought-after color could make this flower a premium addition to arrangements, demanding top price. However, since this plant has not been produced *en masse* before, it is necessary for great amounts of product testing, especially in terms of shelf life after being cut, post-harvest handling,

and distribution issues (Steininger 2011). This may turn out to be an economic boon for some higher elevation communities and growers in established areas though. If these communities find that they fit the exact growing specifications of 'Lingholm' and the right holiday is associated with the flower, the money and business could arrive to fund the necessary testing and trials.

At this time, it is unknown if 'Lingholm' could be scheduled for all-year development, as higher summer temperatures and unknown photoperiod limits could destabilize growth, but it may be possible with coolers for dormancy, and artificial lighting in lower temperature greenhouses. If it is found that they could be programmable, the very reduced heating costs during its growing season may entice greenhouse growers, and particularly cut flower producers, to use 'Lingholm' as a cold-season crop. Currently, 'Lingholm' is forced for late February to middle March and can bloom in the field from May to June. If it is found that they can't be programmed, it may not be a terrible effect, as the desire for true blue flowers are high and the limited availability could keep prices up. Additionally, if the time that blooming could be stretched from late February all the way to mid-June, there are a number of holidays that fall in that time period that could use an auxiliary flower or a flower associated with a particular holiday. On certain years, the fact that the mysterious 'Lingholm' came from a viable seed population, the viability "died" during its time of 'Slieve Donard', and the seed- viability was "resurrected" again, may be able to play into the period of Lent and the Resurrection, depending on the timing of the holiday. There would be competition for market and growth space from Easter lilies, but 'Lingholm' could act as an accent plant around the lily, particularly with the stem hairs resembling a crown of thorns and the yellow stamens a halo. Additionally, World Autism Day is April 2nd, and the color of the cause, is of course blue, which would match the flower and be able to be given by families with autism

and their supporters. Overall, families of children with autism are very keen to spreading awareness and could be deeply invested in exchanging symbols of the day, especially if proceeds could be tied to furthering autism research or education. Also falling in the February to June time is Earth Day and Mother's Day, which could always use auxiliary flowers. Memorial Day traditionally has the Flanders Poppy as its symbol, but it is more associated with the British holiday. The blue poppy could become the new all American version of a symbol of remembrance of the fallen, or to increase patriotic sales, the Flanders poppy, 'Lingholm', and a white *Papaver* ssp could be arranged together. Finally, Father's Day may be able to fall into the final days of outdoor blooming, and there is no universal symbol for that holiday, so it may have the perfect opening to take the spot.

As 'Lingholm' and its relatives are some of the only true blue large flowers, there is actually remarkably little competition in terms of color, size, and form. Other flowers may have similar colors, but have small flowers or short habits, such as forget-me-nots, brunnera, or morning glories. Some are similar in size and form but lack the sought-after color, such as daisies or other poppies. Blue delphiniums can have similar color and height, but may not work well in certain arrangements due to the flower spike, or lack of contrast between petals and stamens. If a large, true blue, rare, and mysterious flower is needed, 'Lingholm' is sure to fit the need.

If testing and trials could be accomplished, and growers and producers accept the opportunity to grow this flower, it could be reasonable to see this flower at a high-end florist by 2025.

C. Marketing Copy

"The mystery of the 'Lingholm' blue Himalayan poppy is now available to growers and florists! The best true blue cut flower is a stunning attention-grabber, with tall stems, huge oval petals,

and vibrant azure color set off by a halo of golden stamens. 'Lingholm' is the absolute choice for early spring to late summer for many in-between holidays, along with the big ones. The mystery of the Resurrection and Lenten season, the perfect color match for World Autism Day, the blue symbolism of Earth Day, a gem for Mother's Day, and finally Father's Day can get its own flower! Memorial Day traditionally has the Flanders Poppy as its symbol in Europe, but the United States now has its own all-American symbol of remembrance of the fallen. If you're looking for a show-stopper during the busy season or keeping heads turning during the holidays in between, the 'Lingholm' Himalayan blue poppy won't disappoint."

IV. Production Information Guide (PIG) and Crop Schedule

The 'Lingholm' variety can fill greenhouse space during times of year that are benches are normally sparse or field crops aren't growing quickly. Since 'Lingholm' is one of the few of the Himalayan blue poppies that easily produces viable seed in cultivation, propagation by seed will be reviewed in Table 2. Seed can be started in greenhouse or outside if conditions are met.

Seed Requirements:

Stratify	At least 30 days, up to 90 days, around 1-2°C
Container	128 cell tray to retain moisture, 3-4 seeds per cell
Media	Top sew in 80% peat moss/15% fine sand/5% fish meal
Moisture	Moist but not wet
Germination	30 days to germinate at 10-15.5°C,
Transplant	Transplant clump of seedlings at first set of true leaves very carefully, as leaves extremely delicate (2-6 weeks after germination)
Sew Date	Late summer/early fall

Pests	Damping off, powdery mildew, slugs, mealy bugs

Table 2. Seeding requirements

As ‘Lingholm’ can have a spread of 1m, transplanting is necessary into large pots or into fields with proper conditions (Table 3).

Container	4x4x10” up to 1 gallon in greenhouse; deep, rich, partly shaded beds protected from cold winds outside, heavy mulch in zone 3
Media	65% mature compost or manure/35% perlite, do not cover crown
Moisture	Moist but not wet
Growing temperature	10-20°C
Fertilization	20-20-20 acidifying 2-3 times /week during first year flush pots on weekends; slow release fertilizer in the spring after first year
Transplant	Transplant clump of seedlings at first set of true leaves very carefully, as leaves extremely delicate (2-6 weeks after germination)
Date	Overwinter in cold frame or indoors

Table 3. Transplanting requirements

‘Lingholm’ must have a dormant period for vernalization, flower bud initiation, and forcing (Table 4).

Dormancy/forcing requirements:

Dormancy	12 weeks, 1-2°C
Container	4x4x10” up to 1 gallon

Media	60/40% coarse peat moss and perlite mix, 5.7-6.2 pH, do not cover crown, remove foliage for dormancy; return to rich media after dormant period, do not cover crown
Forcing temperature	7.2°C days and 10°C nights, with an average forcing time of 60 days
Force date	Start between October and February, depending on bloom date needs
Photoperiod	18 hours

Table 4. Dormancy/Forcing requirements

The overall time table of growth from seed to bloom is 30-90 days for stratification, 30 days for germination, 90-120 days of growth, 45-90 days to overwinter, 60 day forcing period, and up to 30 days in bloom. Total time from seed to bloom is from **285 days to 420 days**. After blooms are harvested, stems should be cooled immediately and sent to wholesaler within two days although more study is necessary for full shipping and handling limitations.

Areas that can handle field production are the Pacific North West, Canada, Alaska, the coasts of the Great Lakes, northern New England, the northern British Isles, the southern Scandinavian archipelago, New Zealand, and cool elevations over 3,000m. Those same or colder areas could use green houses for year-round programming.

Future improvements for 'Lingholm' in the cut flower industry must be studied, in breeding, PGR application, greenhouse programming conditions, handling, and marketing by all links in the horticulture production chain in order to make the most of this mysterious flower that could change the cut flower industry.

V. Acknowledgements

Thanks go to the remarkable work of the Meconopsis Group and also to Christopher Grey-Wilson. Additionally, the opinions, time, and insights of the florists at Koehler and Dramm Wholesale Florists are greatly appreciated

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VII. Abbreviations and Acronyms

PIG- Product Information Guide

PGR- Plant Growth Regulators

RBG- Royal Botanical Garden

RHS- Royal Horticultural Society

USDA- United States Department of Agriculture