

Seed Germination and Viability

by Geoff Hill

The following is a resume of my illustrated talk on the germination and viability of Meconopsis seed which concentrated mainly on some of the monocarpic species that I grow. Based on my seed sowing records it gives a "warts and all" picture of my continuing learning curve in raising these plants.

I grow a lot of plants from seed each year from a variety of sources but to ensure fair comparison the results that I am presenting are mainly from my own collected seed. This is dried, cleaned and is then stored in labelled paper packets in an airtight plastic container in the bottom of the fridge at about 5°C. Most of it goes to the various seed exchanges each year but I always try to retain sufficient seed for 2 or 3 years of sowings to guard against any future crop failures. We are often told of the need to sow fresh seed but whenever I sowed older seed I usually found that it had retained some viability. Exactly how much was uncertain and so over the past couple of years I have sown some of these limited supplies of older seed in counted experiments to find out how much germinated.

I have quite a small garden with a limited amount of cover under glass and this influences the way that I germinate seed. Most of my seed is germinated outdoors totally exposed to the elements. 7cm pots are half filled with potting compost and then topped up with seed compost. Seed is sown on the surface of the pots, covered with a good layer of Flint Chick Grit, and the pots are soaked by immersion in water to half their depth. They are then stood outside on sand trays and covered with rigid wire mesh to protect the seed pots against blackbirds and magpies. After germination I try to move them into a covered frame if space is available.

Meconopsis punicea was first introduced into cultivation by Ernest Wilson in 1903 but the plant soon died out. It was reintroduced by Joseph Rock and others and seems to have remained in cultivation until the 1960's before being lost again. The plants we grow today are the result of the seed collection made in 1986 by Peter Cox. I enjoy growing these plants either singly or in groups and photographing them in all their different moods.

M. punicea is basically monocarpic and has to be raised from seed each year. It has the reputation of being difficult but it isn't and just requires a little care to ensure that sufficient viable seed is obtained to maintain a succession of plants. To get viable seed the plants should be hand pollinated, don't rely on insects to do this for you. I find that the best time to collect pollen is just when the flowers are beginning to fade. If you cup the flower in your hand and bend it back at this stage you will often find loose pollen either on the stamens or on the upper surfaces of the insides of the petals. This can then be transferred to the fresh white stigmas of new flowers with a small paintbrush.

The following notes refer to Table 1 which detail mainly uncounted seed sowings from my past records. They show the influence of sowing date on the time of germination.

As a latecomer to rock gardening I first managed to obtain *M. punicea* seed from the SRGC seed exchange in 1999. It didn't germinate the first winter but I managed to prick out 18 seedlings in the 2nd year (2001). I also bought 3 plants from Ron McBeath in 2000 and flowered and hand pollinated these in 2001. This gave good seed which germinated in 2002/03. By 2003 I had lots of plants in the garden. I did not bother to hand pollinate that year and, as a consequence, I harvested very poor seed which was sown too late resulting in no germination. Seed from 2004 was also sown too late resulting in poor germination that year but fortunately slower developing plants from 2002 were still available to flower and maintain a supply of seed.

It soon became apparent that *M. punicea* seed sown in January/February, at the time seed was normally received from the seed exchanges, would often not germinate until the following season. Better results could be obtained by sowing in the autumn but I did not always put that knowledge into practice frequently preferring to wait until it was convenient to myself before sowing. After all good germination could still be achieved by being patient. Sowings of 2005, 2006, and 2007 seed made at various times of year illustrate this pattern well and also show that older seed can retain good

viability. For completion I have included the results of 2007 and 2008 counted seed sowings in this table but these are also shown in later tables.

<i>Meconopsis punicea</i> - Table 1				Germinated outdoors.
Data extracted from seed sowing records.				
Seed collected	Sowing date	First germinated	Seedlings pricked out	Notes
1999	18 Jan 00	7 Apr 01	18	Seed ex SRGC. Germinated 2 nd year.
2001	14 Feb 02	16 Apr 02	5	Seed ex 3 purchased plants. 2 pots sown. Mainly germinated 2 nd year. 1 plant still in garden and flowered in 2009.
2001	14 Feb 02	22 Feb 03	6	
2001	13 Oct 02	22 Feb 03	9	1 year old seed.
2002	13 Oct 02	23 Feb 03	38	Seed ex plants raised from SRGC seed.
2003	27 Jan 04	-	-	Poor seed, not hand pollinated, both seed pots disturbed by mice.
2004	21 Feb 05	19 Apr 05	No record	Poor germination in 2005, more in 2006.
2004	19 Mar 06	11 Feb 07	10	1 year old seed. Germinated 2 nd year.
2005	6 Sep 05	4 Mar 06	48	5 pots sown.
2005	19 Mar 06	11 Feb 07	50	3 pots sown. Germinated 2 nd year.
2005	28 Jan 07	5 Apr 07	4	1 year old seed.
2005	5 Nov 07	4 Feb 08	13	2 year old seed. 38 seeds sown (34%).
2005	31 Oct 08	19 Feb 09	9	3 year old seed. 20 seeds sown (45%).
2006	28 Jan 07	5 Apr 07	8	2 pots sown.
2006	5 Nov 07	4 Feb 08	13	1 year old seed. 41 seeds sown (32%).
2006	31 Oct 08	19 Feb 09	7	2 year old seed. 20 seeds sown (35%).
2007	5 Nov 07	4 Feb 08	53	6 pots of 25 sown (35%).
2007	5 Feb 08	19 Feb 09	16	2 pots of 20 sown (40%).
2007	14 Jul 08	30 Jan 09	11	1 year old seed. 1 pot of 20 sown (55%).
2007	31 Oct 08	19 Feb 09	7	1 year old seed. 1 pot of 20 sown (35%).

Counted seed sowings.

The seed used in these experiments was of similar size, all of the small seed having been discarded during seed cleaning. The seed was mixed together and then the pile of seed was repeatedly divided into half until roughly twice the required amount of seed had been separated out. The tip of a knife was then used to count out alternately the required number of seeds into two piles. One of these piles was chosen at random for sowing.

Table 2 below shows the germination results of seed sown in November 2007 and February 2008. The November sowings of 1 or 2 year old seed showed a similar germination rate to that of fresh seed. The February sowing of 2007 seed did not germinate until the following season but still showed a similar germination rate (40%).

<i>Meconopsis punicea</i> – Table 2				
November 2007 and February 2008 sowings of old and fresh seed, 20 seeds per pot. Germinated outdoors.				
Seed collected	Sowing date	First germinated	Seedlings pricked out	Germination
2005	5 Nov 07	4 Feb 08	13	2 year old seed. 38 seeds sown (34%).
2006	5 Nov 07	4 Feb 08	13	1 year old seed. 41 seeds sown (32%).
2007	5 Nov 07	4 Feb 08	53	Fresh seed. 6 pots of 25 sown (35%).
2007	5 Feb 08	19 Feb 09	16	Fresh seed. 2 pots of 20 sown. Seed germinated in 2 nd year (40%).

Germination rates of only 35% to 40% led me to wonder whether another method of germinating the seed might produce better results and so in 2008 I decide to keep back sufficient of my own *M. punicea* seed to carry out experiments on a larger scale looking at:

1. the influence of the time of sowing seed
2. whether or not there were any benefits of sowing seed under cover
3. the viability of the same batch of seed over a period of several years

The bulk of the seed collected in 2008 was generally smaller than that collected in 2007 and is referred to as “standard seed” in Tables 3, 4 and 5 below. Particularly large seed was collected on a few occasions in 2008 and this was kept and sown separately. Similarly some smaller seed which would normally have been discarded was sown to see if it was viable.

Seed was sown at roughly monthly intervals from July 2008 until February 2009 and once germinated the number of seedlings in each pot was counted and recorded on a weekly basis. To try to ensure fair comparison between seed germinated outdoors and that under cover the seed germinated outdoors was left outside even after germination (normally I would have tried to give the young seedlings some protection).

Because just a limited amount of older seed was available this was only sown in October. The results of the October sowings are shown in **Table 3**. It was found that the germination of different collections of fresh 2008 seed varied between 40% and 80%. Older seed of up to 3 years old still showed an acceptable level of germination of between 35% and 45%. (N.B. this does not necessarily mean that the older seed has lost viability since there seems to be little significant change in these germination rates from those found when sown in earlier years – see Table 1.) Rather surprisingly the large fat seed collected in 2008 did not germinate as well as smaller seed.

<i>Meconopsis punicea</i> – Table 3				
October 2008 sowings of old and fresh seed, 20 seeds per pot. Germinated outdoors.				
Seed collected	Sowing date	First germinated	Seedlings germinated at 4 Apr 09	Germination
2005	31 Oct 08	19 Feb 09	9	45%
2006	31 Oct 08	19 Feb 09	7	35%
2007	31 Oct 08	19 Feb 09	7	35%
2008 standard seed	31 Oct 08	19 Feb 09	14 (1 died)	70%
2008 larger seed	31 Oct 08	21 Feb 09	9 (1 died)	45%
2008 smaller seed	31 Oct 08	28 Jan 09	11 (3 died)	55%
2008 ex long lived plant	31 Oct 08	30 Jan 09	16	80%
2008 late collected seed	31 Oct 08	27 Jan 09	8	40%

Table 4 shows a comparison between “standard seed” and larger seed sown in pots at roughly monthly intervals and germinated outdoors. The % germination for standard seed sown up until the beginning of December did not vary very much (70%+) but seed sown in January gave poor

germination and that sown in February did not germinate in 2009. This appears to confirm that *M. punicea* seed sown later than December might not germinate the following spring.

The “standard seed” tended to germinate a few days earlier than the larger seed and generally had a higher germination rate. Germination of the larger seed fell away significantly when sown later than July/August/September.

<i>Meconopsis punicea</i> – Table 4						
2008 seed sown at monthly intervals, 20 seeds per pot.						
Germinated outdoors.						
Sowing date	Standard seed			Larger seed		
	First germinated	Number germinated at 4 Apr 09	Germination	First germinated	Number germinated at 4 Apr 09	Germination
14 July 08	16 Jan 09	14 (3 died)	70%	30 Jan 09	16 (1 died)	80%
17 Aug 08	21 Jan 09	17 (1 died)	85%	23 Jan 09	16	80%
30 Sep 08	25 Jan 09	15 (1 died)	75%	28 Jan 09	13 (1 died)	65%
31 Oct 08	28 Jan 09	14 (1 died)	70%	21 Feb 09	9 (1 died)	45%
6 Dec 08	25 Feb 09	14	70%	1 Mar 09	7	35%
11 Jan 09	18 Mar 09	3	15%	-	0	Nil
3 Feb 09	-	0	Nil	-	0	Nil

My attempts to germinate *M. punicea* under cover in a well ventilated cold frame were not a success. **Table 5** shows that only the July sowings gave a good germination of seed. Germination was generally poorer than corresponding sowings which were kept outdoors and sowings made after July resulted in almost total seedling loss with the stems of germinated seedlings quickly turning black and withering. This year I am carrying out some further limited sowings under glass and watering these pots with different fungicides to see if this proves beneficial.

<i>Meconopsis punicea</i> – Table 5						
2008 seed sown at monthly intervals, 20 seeds per pot.						
Germinated under cover in a well ventilated cold frame.						
Sowing date	Standard seed			Larger seed		
	First germinated	Number germinated at 4 Apr 09	Germination	First germinated	Number germinated at 4 Apr 09	Germination
14 July 08	16 Jan 09	18	90%	25 Jan 09	15	75%
17 Aug 08	21 Jan 09	10 (8 died)	50%	31 Jan 09	9 (8 died)	45%
30 Sep 08	30 Jan 09	7 (7 died)	35%	-	0	Nil
31 Oct 08	29 Jan 09	4 (4 died)	20%	1 Mar 09	5 (5 died)	25%
6 Dec 08	22 Feb 09	3 (3 died)	15%	-	0	Nil
11 Jan 09	17 Mar 09	2 (2 died)	10%	-	0	Nil
3 Feb 09	-	0	Nil	-	0	Nil

Monocarpic or polycarpic?

Although *M. punicea* is essentially monocarpic very occasionally plants will flower for more than one season. I was aware of this happening in my own garden but when a number of plants were being planted at different times during the year it was difficult to be absolutely certain of which of those that remained had flowered previously. To keep a check I have recently resorted to recording the number of flowering stems removed from each plant on its plant label. Two images were shown of plants photographed the previous week. These had both flowered in 2008, one with 11 flowering stems and the other 6. They had not died back completely and did not flower in 2009 but both had developed healthy rosettes and should flower again in 2010.

Some other instances that I am certain about:

One plant purchased in 2000 flowered for 6 years. After 3 years it was dug up and inspected. The root system appeared to be atypically fibrous and so the plant was split into 6 parts. 3 died fairly quickly, 2 flowered again then died and the other survived and flowered for a further 3 years. This division was always a fairly weak plant with small semi-double flowers but was used for pollination.

Another 2002 sown plant which had been planted in a drier area sulked before being moved and eventually flowered for the first time in 2009 with 16 flowering stems. It had a number of large non flowering rosettes in the early autumn and looked as if it might flower for another season but rot has since got into the tap root undermining good rosettes and the plant may not survive the winter. The tap root has been cleaned as far as possible and treated with a fungicide.

I would regard these plants as long-lived but not perennial. If the plant is sufficiently large to still have rosettes which have not flowered at the end of the season it may survive to flower again provided that dying rosettes are detached before rot gets into the main tap root. Treatment with a fungicide might help prolong the life of such a plant. Ian Christie however does have a form of *M. punicea* which appears to be truly perennial. It is stoloniferous and can be propagated by division.

Number of flowering stems per plant

When he spoke to us last February Alan Furness commented that photographs of plants in the wild often did not have many flowers and wondered how many flowers we should expect on cultivated plants. As I had been recording the number of flowering stems removed from a plant on its label for the past couple of years I analysed my data. In good conditions I found that most had between 6 and 10 flowers but a few exceptional plants had up to 20. I suspect that better feeding would increase the average number of flowering stems.

<i>Meconopsis punicea</i> – Table 6		
Number of flowering stems per plant in different areas of the garden.		
	Moist humus rich soil with an open aspect.	A dryer humus rich soil beneath trees.
Number of flowering stems per plant.	Number of plants in each range.	Number of plants in each range.
0	1	3
1 – 5	7	21
6 – 10	11	3
11 – 15	4	0
16 – 20	4	0
Average number of flowering stems per plant	8.4	3.0

Meconopsis integrifolia is a plant that I have found quite difficult and have lost on a number of occasions. It is a plant of the high mountain slopes that does not like our mild wet winters. It should be covered with a pane of glass during the winter period to protect the crown from getting too wet. I also excavate a small area around the resting bud and fill this with gravel to ensure good drainage and prevent it from rotting.

The leaves show three prominent veins and are covered with fine hairs on both surfaces. The large flowers are upright and globular. They tend to become "blowsy" when fully open and to bend back in the wind. Following heavy rain they can become almost transparent.

My plants were initially raised from SSSE seed submitted to the Meconopsis Group seed exchange by Ian Christie.

Seed sown at the beginning of December germinated quite well but the seed sown towards the end of January did not. As *Meconopsis integrifolia* germinates and flowers early in the year it is likely to benefit from early sowing. This year I sowed in October.

<i>Meconopsis integrifolia</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2006 seed (M06-1525)	-	28 Jan 07	15 Mar 07	-	4 grown on
2008 seed	40	7 Dec 08	19 Feb 09	19	48%
2008 seed	40	26 Jan 09	25 Mar 09	1	3%

Meconopsis pseudointegrifolia is a much easier plant in the garden and over winters well without protection. It is sometimes found in the wild in high marshy meadows. The leaves have one central vein with a network of smaller veins radiating from this. The flowers are paler in colour than *M. integrifolia*, more of a lemon-yellow, and have a longer style. Well grown plants can have a cluster of several flowers per stem.

4 year old *Meconopsis pseudointegrifolia* seed germinated just as well as my fresh 2008 seed. It is interesting to note that *Meconopsis pseudointegrifolia* germinated two weeks later than *M. integrifolia* sown on the same date (6 March cf. 19 February).

<i>Meconopsis pseudointegrifolia</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2004 seed	-	21 Feb 05	5 Apr 05	-	1 grown on
2004 seed (1 year old)	-	19 Mar 06	4 May 06	-	5 grown on
2004 seed (2 years old)	-	29 Jan 07	1 Apr 07	-	8 grown on
2004 seed (4 years old)	34	6 Dec 08	13 Mar 09	14	41%
2008 seed	40	6 Dec 08	6 Mar 09	12	30%

Meconopsis superba from western Bhutan and Tibet can take 2 to 4 years to flower from seed. The large silky leaf rosettes are a very attractive feature in the garden but young plants should be covered by a pane of glass in the winter to keep the rosettes dry as they are prone to rotting in wet winters. The rosette of one 3 year old unflowered plant of mine was badly damaged by the heavy rain we had this August.

Plants start to flower at about 2ft but then rapidly grow to 5 or 6ft. The large pure white flowers with a purple-black stigma are individually very beautiful but after flowering their stems extend quickly and the plant can soon begin to look a little untidy. The ovoid seed capsules are large with a length of about 2" but the seeds are very small and rounded. Perhaps surprising in view of their small size seeds had retained good viability after 7 years storage. Care should be taken to provide plenty of ventilation to young seedlings as they are prone to damping off.

<i>Meconopsis superba</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2001 seed	-	14 Feb 02	9 Apr 02	-	Several seedlings
2001 seed (5 years old)	-	27 Mar 06	4 May 06	-	42 grown on
2001 seed (7 years old)	100	7 Dec 08	10 Mar 09	38	38%

Meconopsis quintuplinervia

I don't usually propagate this from seed as it is much easier to raise new plants by division but as I had received some seed of *M. quintuplinervia* Farrer's form from Evelyn I also sowed some very old *M. quintuplinervia*. This 6 year old seed sown in December showed little viability producing only one

seedling right at the end of the germination period but then that was one more than when the same seed had been sown in 2001! A December sowing may have been far too late for this species as it is normally recommended that seed should be sown fresh in July/August. An August sowing of the 2008 seed of Farrer's form germinated acceptably well outdoors but the same seed sown in a covered frame did not germinate for me.

<i>Meconopsis quintuplinervia</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2002 seed (6 years old)	40	7 Dec 08	25 Mar 09	1	3%
2008 seed (Farrer's form)	20	17 Aug 08	18 Mar 09	8	40%

Meconopsis x beamishii (*M. integrifolia* x *M. grandis*)

Most of the plants of this hybrid raised from seed tend to be monocarpic but some are perennial and can survive for many years. I found that 6 year old seed had retained good viability.

<i>Meconopsis x beamishii</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2002 seed	-	2 Feb 03	23 Mar 03	-	Several seedlings
2002 seed (6 years old)	40	7 Dec 08	1 Mar 09	25	63%
2008 seed	40	7 Dec 08	1 Mar 09	28	70%

Meconopsis robusta

This seed came from a plant that had been bought under this name. True *M. robusta* is racemose with flowers on individual stems whilst the related *M. paniculata* flowers on branching stems. The photographs show that this plant is clearly racemose with very rounded seed capsules but Ron McBeath thought that it looked untypical and was perhaps a garden hybrid. David Rankin has since found that the seed was different to that of both *M. paniculata* and *M. napaulensis* when examined under the microscope.

2 year old seed sown in December did not give a very good germination.

<i>Meconopsis robusta</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2006 seed (2 years old)	50	7 Dec 08	20 Mar 09	9	18%

Meconopsis grandis

2 year old seed germinated well. These sowings showed the opposite pattern of viability to what might have been expected but the 2006 seed was particularly good and the 2008 seed not quite so plump.

<i>Meconopsis grandis</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2006 seed	-	28 Jan 07	20 Mar 07	-	9 grown on
2006 seed (2 years old)	40	7 Dec 08	6 Mar 09	30	75%
2007 seed (1 year old)	40	7 Dec 08	1 Mar 09	18	45%
2008 seed	40	7 Dec 08	1 Mar 09	12	30%

***Meconopsis* 'Evelyn'**

This is a form of *M. grandis* recently named in honour of Evelyn Stevens. The emerging leaves are very distinctive and are covered on both surfaces with a dense pile of brown hairs. The plant is smaller in stature than most of the other *M. grandis* cultivars and flowers quite late in the year, typically opening its first flowers at the beginning of June. The flowers are initially a dark blue and are rather reminiscent of *M. 'Mrs Jebb'* in colour and shape. They eventually fade to a paler blue as they age. The plant produces fertile seed but as seed raised plants may show some variability this cultivar should only be propagated by division. These seedlings were raised to prove that the seed was fertile. Fresh seed showed a much higher level of germination than stored seed.

<i>Meconopsis</i> 'Evelyn'			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2006 seed (2 years old)	40	7 Dec 08	-	0	Nil
2007 seed	-	5 Feb 08	6 Apr 08	-	15 grown on
2007 seed (1 year old)	40	7 Dec 08	6 Mar 09	7	18%
2008 seed	40	7 Dec 08	1 Mar 09	31	78%

Meconopsis delavayi

I tried for many years without success to grow this. Seed germination was never a problem but subsequent treatment was. The seedlings always seemed to die if they were pricked out in the first year but equally if left to over winter in the seed pot they didn't reappear again. Older plants will regenerate from their swollen tap roots but the plant first has to form a big enough root for this to happen. Eventually I managed to raise one plant which has flowered for the past two years and has set seed this year.

Seedlings are susceptible to damping off and have somewhat brittle stems. Now I prefer to sow one or two seeds per 6cm round pot in a gritty well drained compost and to avoid handling the seedlings by simply potting on the whole pot into a larger pot. This method has proved successful in raising a number of plants. All of this *M. delavayi* seed came from the Meconopsis Group seed exchange. It germinated well outdoors but I have so far been unsuccessful in raising plants from seed sown under cover

<i>Meconopsis delavayi</i>			Germinated outdoors		
	Number of seeds sown	Sowing date	First germinated	Number germinated	Germination
2004 seed (M04-1306)	30	20 Feb 05	19 Apr 05	-	1 plant raised and flowered
2007 seed (M07-1607) (sown 2 seeds per 6cm pot)	44	18 Feb 08	19 Apr 08	-	19 plants raised (43%)
2008 seed (M08-1710)	14	3 Feb 09	31 Mar 09	11	79%
2008 seed (M08-1710)	14	3 Feb 09	31 Mar 09	10	71%
2008 seed (M08-1710)	14	3 Feb 09	31 Mar 09	10	71%
Germinated in a covered frame					
2008 seed (M08-1710)	14	3 Feb 09	31 Mar 09	2	14% (both died)

***Meconopsis punicea* - Germination periods for seed sown at monthly intervals.**

M. punicea seed germinated during some of the coldest periods of the year. Seed continued to germinate over a period of time and the weeks during which germination took place are shaded in grey in the table below. The temperatures shown are Edinburgh temperatures taken from my daily newspaper. As I live on higher ground outside Edinburgh the temperatures at night are likely to have been a little lower.

Sowings made prior to the end of October germinated at much the same time towards the end of January. The December sowing germinated 4 or 5 weeks later but still gave good % germination. The January sowing only germinated towards the end of the germination period and germination was poor. A February sowing did not germinate this year.

<i>Meconopsis punicea</i>																		
Periods of Germination for 2008 “standard seed” sown at monthly intervals.																		
																		Germinated outdoors
Date sown	Period of germination																	% Germination
	Jan 09					Feb 09				Mar 09				Apr 09				
	3	10	17	24	31	7	14	21	28	7	14	21	28	4	11	18	25	
14 Jul 08																		70%
17 Aug 08																		85%
30 Sep 08																		75%
31 Oct 08																		70%
6 Dec 08																		70%
11 Jan 08																		15%
3 Feb 09																		Nil
Maximum and minimum weekly temperatures, Edinburgh °C																		
Max.	5	6	12	8	9	4		12	12	10	11	14	13	19	16	16	18	
Min.	-3	-5	-1	1	-2	-5		2	4	-2	0	1	2	-1	4	0	-1	

Species and hybrids - Germination periods for December 2008 sowings.

Sowings made at the beginning of December germinated outdoors from mid February onwards with most species appearing to take a minimum of around 12 weeks to germinate. *M. integrifolia* in particular may have benefited from being sown earlier and the previous table also showed that *M. punicea* germinated a month earlier when it was sown 5 weeks earlier.

It is interesting that *M. delavayi* gave good germination at the end of March from a February sowing.

Periods of Germination for the sowings of species and hybrids made in December 2008.																		
																		Germinated outdoors.
Sown	Period of Germination																	% Germ.
	Jan 09					Feb 09				Mar 09				Apr 09				
	3	10	17	24	31	7	14	21	28	7	14	21	28	4	11	18	25	
Sown 6 or 7 Dec 08																		
<i>M. integrifolia</i>																		48%
<i>M. punicea</i>																		70%
<i>M. x beamishii</i>																		70%
<i>M. pseudointegrifolia</i>																		30%
<i>M. grandis</i>																		30%
<i>M. 'Evelyn'</i>																		78%
<i>M. superba</i> (2001 seed)																		38%
<i>M. robusta</i> (2006 seed)																		18%
<i>M. quintuplinervia</i> (2002 seed)																		3%
Sown 3 Feb 09																		
<i>M. delavayi</i>																		74%
Maximum and minimum weekly temperatures, Edinburgh °C																		
Max.	5	6	12	8	9	4		12	12	10	11	14	13	19	16	16	18	
Min.	-3	-5	-1	1	-2	-5		2	4	-2	0	1	2	-1	4	0	-1	

Summary

Germination of *Meconopsis* is facilitated by exposure to a period of low temperatures. I prefer to cover the seed pots or pans with a good layer of grit and keep them outdoors until germination begins.

Although seasonal effects undoubtedly come into play I would recommend sowing early if possible as some species will germinate towards the end of January if conditions are favourable. Seed of these species sown later than December might not germinate until after a second winter. If seed is received too late to do this then either sow the seed anyway and keep the pots outside until they do germinate, or else store the seed in a dry airtight container at the bottom of the fridge and sow the following autumn.

Older *Meconopsis* seed properly dried and stored in cool conditions might still be viable. Some species appear to retain good viability for several years.