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To cite this article: Karin Alton & Francis L. W. Ratnieks (2020) Caveat Emptor: Do Products Sold to Help Bees and Pollinating Insects Actually Work?, Bee World, 97:2, 57-60, DOI: [10.1080/0005772X.2019.1702271](https://doi.org/10.1080/0005772X.2019.1702271)

To link to this article: <https://doi.org/10.1080/0005772X.2019.1702271>



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Published online: 21 Jan 2020.



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# Caveat Emptor: Do Products Sold to Help Bees and Pollinating Insects Actually Work?

Karin Alton  and Francis L. W. Ratnieks

Bees and wildlife are much in the public eye these days, with frequent media reports of declines. Helping wildlife is not an easy task. In the UK, for example, approximately 70% of the land area is used for agriculture. Clearly, helping wildlife at a national level requires agricultural land to play a major role and there are various encouragements for this, with funding opportunities like the Countryside Stewardship scheme (Supplement 1) (244 separate grants including for 'badger gates', 'beetle banks', and 'autumn sown bumble bee mix') and advice and support from organisations such as LEAF (Linking Environment and Farming) (Supplement 2).

What can the general public do? Many people undertake to make their own gardens more wildlife friendly. There are various ways to do this, including creating ponds and providing more plants suitable for wildlife, such as by planting varieties that provide seeds and nest or shelter sites for birds (Supplement 3), or nectar and pollen for bees (Supplement 4). Additionally, a plethora of products such as nest boxes, feeding stations and wildlife friendly seeds are available to purchase on-line and in garden centres. Internet shopping websites such as Amazon UK list over 10,000 products for bees in their Garden and Outdoors section.

Here we take a close look at a number of these products which are specifically designed to help bees and other insects: bee hotels, bee bricks, bee and butterfly seed balls, and ladybird and butterfly houses. Our investigation uses a number of approaches, including expert responses and scientific research results.

## Bee Hotels

Most people are familiar with a honey bee hive, a box provided by a beekeeper and which contains a whole colony. The young

are reared in hexagonal wax cells built by the worker bees. However, most wild bees do not live socially. Known as solitary bees, each female builds her own small nest with a few cells each provisioned with pollen mixed with nectar into which an egg is laid. Many species nest in tunnels they dig in the soil. Others nest in gaps in the mortar or brick work of a building or in hollow plant stems or other cavities in vegetation, some species even drilling their own cavity using their jaws. Man-made Bee Hotels (e.g., Figure 1a), aim to mimic these above-ground nest sites. They come in a variety of shapes and sizes, from small wooden boxes containing hollow bamboo canes to award-winning house bricks containing multiple nesting holes. But are these actually good for bees?

A research project in Toronto, Canada, set up 600 bee hotels to investigate their role in the conservation of native bees (MacIvor & Packer, 2015). The results were not entirely positive or straightforward in terms of helping native bee species. Nearly half (47%) of the bees nesting in the hotels were introduced species. In addition, the most common insects to use the hotels were actually solitary wasps. Bee hotels artificially aggregate the number of nesting sites above the natural densities found in nature. Cavity-nesting bees using these boxes are therefore more susceptible to brood parasitoids such as *Monodontomerus* wasps (Supplement 5), which recognise their host(s) using visual and chemical cues (MacIvor & Salehi, 2014). The researchers concluded that 'More research is needed to elucidate the potential pitfalls and benefits of using bee hotels in the conservation and population dynamics of wild native bees'. It is certainly the case that bee hotels can attract solitary bees and wasps to nest. But it is not clear if this is helping in the conservation of native bee species. Perhaps there are already sufficient nesting sites.

## Bee Bricks

Bee bricks are a recent arrival on the commercial bee hotel market scene. Designed by the Cornish company, Green & Blue (Supplement 6) (Figure 1b), it is a concrete brick with holes that can stand alone or be used in place of a standard brick in construction. The sales information says it has been designed to be included in new build projects as a 'fit and forget' component. The company's website states that '... the bee brick provides a stylish nesting site for red mason bees and leaf cutter bees, amongst others, and makes a real design statement in any garden, allotment or building... a great gift for garden lovers, design lovers and nature lovers...' The brick retails at £27.50 plus £4.95 postage, and forms part of a range of concrete bee houses and blocks on sale. The bee brick/block is also sold at on-line outlets that include builder's merchants such as Discount Build Suppliers (Supplement 7) and conservation organisations such as The Eden Project (Supplement 8) and Kew Gardens (Supplement 9), who comment on their website 'A great gift for gardeners or wildlife lovers!'

Industry awards are known to be beneficial to the marketing and sales of a product (Supplement 10). A potential purchaser is reassured that a product is a good buy. Green & Blue are proud of the innovation awards their bee brick has received; they state on their website: 'We know our products work and look great but it's good to know others agree too!' However, how do the company itself and award-granting bodies know that it works?

We took a closer look at one of the awards listed on Green & Blue's website, the Soil Association's Innovation Award 2014. On contacting the Soil Association, we learnt that the award is given to people who have developed an entrepreneurial idea relating to food and farming, and that the bee brick

DOI: 10.1080/0005772X.2019.1702271



**Figure 1.** Just a small selection of the many items offered on sale to ‘help’ wildlife in your garden, in particular solitary bees, butterflies and ladybirds. These include a bee nest box in wood (a) and in brick (b); a tin of balls of flower seeds and clay (c); a butterfly house (d); and a shelter for ladybirds (e).

was voted for by a wide-ranging audience at participatory events (Christman, 2014). The Soil Association made it clear in a personal communication in October 2017 that the awards were for ‘the development of creative new ways of doing things with a social/environmental purpose’, and NOT whether or not they, in fact, work.

Clearly Green & Blue have seen solitary bees use the bricks, and there are photos of this on their website. Following the Soil Association award, Dr Rosalind Shaw of the University of Exeter was approached for a more scientific look at the efficacy of the brick. Two Masters students undertook a small project to see what, and how many, bees nested in the bricks in the summer of 2016. Although at the time of writing some of the data have yet to be analysed, initial results show that only 23 out of 128 bricks were colonised by bees in this experiment. Out of a total 2432 possible nesting opportunities (holes) for solitary bees, only 85 were used. That gives a mere 3.5% rate of occupancy (Crookes, 2016; Gilbert, 2016)! A similarly sized concrete brick retails at about one pound, so perhaps a more cost-effective method would be to use a drill with a masonry bit, making holes of the appropriate size (Supplementary 11) and using this instead.

Furthermore, the dimensions of the holes in the bee brick may be too small for solitary bees such as *Osmia bicornis*. The bee brick holes measure up to 70 mm in length with diameters of 6 or 7 mm. Although *O. bicornis* females accept nest tubes of a wide range of diameters and lengths, the sex ratio shifts toward males in tubes shorter than 130 mm. Researchers found that artificial nest tubes/cavities of 8–10 mm internal diameter at least 150 mm long,

more than twice the length of the bee brick holes, were optimal for rearing *O. bicornis* (Seidelmann, Bienenach, & Pröhl, 2016).

Another problem with the bee brick, and the concept of fit and forget, is maintenance. Without checking and cleaning bee hotels, winter mortality of larvae due to fungus moulds is likely to increase, and so is the spread of parasites (Supplement 11). George Pilkington of Nurturing Nature suggests that annual management, such as changing the nesting material, is essential for healthy bees (Supplement 5,12). Dr Robert Fowler, a bee scientist at the University of Sussex, was concerned that the brick does not allow for cleaning out the tubes. He was unsure how long they would remain effective without at least some rudimentary clearing out of old nest materials and other debris (Pers. com., October 2017). Rolled paper linings inserted into the tubes may be used, and although the bees might occasionally remove them, they can be thrown away each year. In any case, putting paper rolls inside the bee brick is tricky, especially if it is in situ high up a wall, and any gaps between the paper and the brick hole may allow parasitic wasps to enter the tubes.

It is unfortunate that the cost of proper scientific testing is most often outside the scope of many small businesses. This would have allowed Green & Blue to have made the brick more suitable for bees. All of the researchers approached for advice did, however, feel that the bee brick in its current form was a great home for spiders.

## Seed Balls

Another product designed to help bees and other flower-visitors is sold in an

attractively packaged tin. The tin contains up to 1000 wild flower seeds rolled into 20 seed balls, by means of a coating of ‘clay & chilli to naturally protect from seed predators such as ants, birds and slugs’. This product costs £6.99 + £0.99 delivery and is made by the company Seedball (Figure 1c). A variety of tins are sold, including Butterfly Mix, Bee Mix, Urban Meadow, Native Poppy and others. The tins are sold on Amazon and are displayed alongside a long list of endorsements. Near the top of the page for the Bee Mix (Supplement 13) it notes that seed balls were ‘winner of gift of the year 2017 & best new gardening product 2017’. Also seen on the BBC, ‘the Guardian and currently sold at Kew Gardens’, and are ‘created by conservation scientists’. On the page for a special offer of 3 tins (Bee Mix + Butterfly Mix + Urban Meadow) (Supplement 14) it notes that this will ‘Turn your garden into a haven for bees and butterflies’. Also noted is the key advantage of the seed balls, which is their ease of use: ‘Our gardeners love the mix of wildflowers in our bee mix & how easy seed balls are to use - no need to ‘plant’, just scatter on top of soil.’

Whilst there has been some recent concern about fake reviews on internet shopping websites such as Amazon (Supplement 15), genuine reviews made by verified purchasers can be spotted from their review profile. The Consumer Rights group ‘Which’ have clear information on their website (Supplement 16) on how to spot a fake reviewer. When we looked at the critical and balanced comments made by verified purchasers (and checked their profile) on internet shopping sites, such as Amazon, they often highlight the pros and cons of products. So what do people who have bought ‘Bee Mix’ seed balls (Supplement 13) on Amazon think of them? Many buyers liked the product because it was attractive. The tin is pretty and makes for a good gift. There were also a few positive comments from satisfied customers who had bought and tested the product but, in contrast, most who had actually tried the seed balls reported no or poor seed germination.

Rusty Burlew, a master beekeeper with a degree in agronomy and a masters in environmental studies, hosts a website called HoneyBeeSuite.com (Supplement 17), where she blogs on aspects of contemporary issues in beekeeping and bee science. In her blog post ‘Why seed bombs don’t work’ she argues that distributing pollinator plants far and wide by throwing clay-encrusted flower seeds into waste or indeed fertile areas—‘is a happy thought that is mostly just that, a

happy thought'. People may like to throw the seed balls or bombs on bare soils in their gardens or neighbourhoods, but these are often heavily compacted by repeated and frequent use; driven over, walked on, or peed on by every passing dog, and will be too hard for the seeds to germinate. The chosen area may also be too sunny, too shady, too wet, or too dry. Even fertile areas pose problems, grasses most often take over and quickly out-compete the wildflowers, if these do indeed germinate from the seed balls to start with.

Another Seedball product is the Butterfly Mix (Supplement 18) seed balls. Looking at the comments made by verified purchasers, the results were similar to the Bee Mix, but more extreme. The descriptive wording of the Butterfly Mix seed balls clearly gives the impression that the respected organisation Butterfly Conservation (Supplement 19), which has also carried out much research, recommends this product: 'Butterfly Mix seed balls - Mix Of 1000 Native Wildflower Seeds For Butterflies. Forget Me Not, Yarrow, Red Champion, Purple Loosestrife, Musk Mallow. Super Easy To Use & Grow. Recommended By The Butterfly Conservation Organisation. \*RHS Perfect For Pollinators\* Check Out The Full SEEDBALL Range!! \*Ideal Garden Gift\*'

However, when we contacted Butterfly Conservation (BC), their Media Officer, Natalie Ngo, confirmed that they do not endorse Butterfly Mix seed balls. Moreover, a member of the BC staff had been in touch with Seedball about this transgression in the past. Ngo commented: 'It is rather cheeky and they were asked to amend it but haven't!' Seedball had replied to them that BC endorsed their product because BC recommends some of the plant species incorporated into the seed balls (Pers. com., Oct 2017).

## Insect 'Homes'

### *The Butterfly House*

A few decades ago, the butterfly house, also called a hibernation box, was launched to help to provide butterflies with a place to hibernate. These houses are generally tall, slim or round, and mostly made from wood. The structures are usually attractive and as they are supposed to help conserve butterflies, newspapers and garden and nature magazines were quick to promote this new innovation in wildlife management.

Gardigo (Supplement 20) (Figure 1d) sells, on Amazon, the 'Butterfly House

for Breeding Butterflies and Garden Decorations' for £10.99 plus £8.90 postage (shipped in from a German seller). It claims 'to provide a nesting and feeding habitat for butterflies and other beneficial insects; be very educational; find and observe fascinating insects in your garden'; be resistance against bad weather conditions and pest infestations; will naturally maintain the health of your plants in the yard, or garden by attracting beneficial insects; and is perfect for placement in the yard or garden!'

On paper that certainly sounds like an excellent addition to the garden. But what did the balanced and critical reviews from verified purchasers on Amazon think of this product? Most buyers seemed happy with their purchase on the basis that it made a great gift and looked attractive in the garden. However, no one seemed to mention butterflies actually using the house.

This mirrors the experience of Terry Johnson, a former Nongame program manager with the Wildlife Resources Division, with the butterfly house (Supplement 21). He states: 'As it turns out there are very few records of butterflies ever making their way inside butterfly boxes. Like me, others have found that butterfly boxes are more likely to attract cockroaches, wasps, spiders and ants'. He commented that some years back, the North American Butterfly Association (NABA) (Supplement 22) asked its members if anyone had found butterflies actually using butterfly houses. However, not a single member had observed any doing this, so the NABA concluded that butterflies don't use these structures.

Johnson suggests that the reason that butterfly houses don't work is because the vast majority of butterflies don't overwinter as adults. Most spend winter as an egg, pupa or chrysalis. For example, in the UK 9 butterflies overwinter as an ovum (egg), 32 as a larva (caterpillar), 12 as a pupa (chrysalis), and only 4 species (Peacock, Comma, Small tortoiseshell, Brimstone) overwinter as an imago (adult) (Supplement 23). Johnson explains that hardy butterflies seek shelter in a variety of places during winter. These locations could include wood piles, bark fissures, abandoned buildings, and hollow trees. On warm winter days the butterflies may emerge and return again when the temperature drops.

Rik Mikula, known as The Butterfly Man (Supplement 24), is President of Butterfly Rescue International and serves as consultant to both the Association For Butterflies and The International Butterfly

Breeders Association. He comments on his website, The Butterfly Website (Supplement 25), 'will it (butterfly house) work? Probably not! But they look great and add to the charm of any garden'. Mikula has placed a butterfly house in the sunniest part of the garden. He confesses that 'it is at the wrong height and probably facing the wrong direction', but concludes 'But who cares. It makes for great conversation!'

### *The Ladybird Tower*

Amazon also stock a Wildlife World Ladybird Tower (Supplement 26) (Figure 1e), which can also be bought from other on-line retailers priced from £10.49 to £17.88 plus £4.49 postage. It is described as being a 'Habitat for Ladybirds'. Ladybirds are beetles. Many are beneficial insects which are natural predators of aphids. The ladybird tower is 'made from naturally durable timber, complete with garden pole/spike, and easily integrates within any garden'. Wildlife World also are rightly proud of the number of awards they have acquired. However, the one received from the Garden Industry Manufacturer's Association (GIMA) is the only one alluded to on their website. This annual award recognises excellence in new products, marketing support and export achievements, and is not related to product performance. In other words, the award is for the fact that the product sells, not that it is used by or helps ladybirds.

Only 3 out of 186 verified purchasers mention seeing a bug (ladybird), whilst another 4 actually went to the trouble of placing ladybirds on the log. This could be due to the hibernating behaviour of ladybirds. According to UK Beetle Recording (Supplement 27), 7-spot ladybirds generally overwinter in low herbage, gorse and conifer foliage, and can often be found in curled dead leaves. In the autumn 7-spot ladybirds are seen sheltering in dry seed heads, such as teasel and cow parsley. Dr Alan Stewart, a leading Coleoptera scientist at the University of Sussex, is not surprised internet shoppers did not see the ladybird tower occupied. He commented that ladybirds like to overwinter in bark cracks and crevices. He doubts that they would particularly go for round holes. Stewart concludes 'it would probably get filled by earwigs and spiders' (Pers. Coms., August 2019).

The comments given by the Amazon verified customers are interesting, because on Wildlife World's website their 'About' section reads: *Our products are extensively tested at our base in Chavenage, Gloucestershire and also in our wildlife*

woodlands in the heart of Devon. During this testing process we are able to monitor prototype performance and fine-tune features. Ensuring that by the time the product finally goes to market, it is fit for purpose and ready for use by wildlife. Perhaps the company has yet to test their Ladybird Tower product, as no verified purchaser found that it attracted any ladybirds.

## Discussion

It would be convenient if supporting wildlife was as simple as buying an item and putting it in the garden. However, the results of our investigation indicate that many of the products on sale may not be of much help at all. Their success as products seems more to do with the fact that they offer the promise, if not the reality, of helping wildlife to a public that is seeking ways to aid and to encounter wildlife. When awards are given these appear to be more for sales and novelty than for actually helping the target insects.

Marc Carlton, an experienced wildlife gardener who runs the website The Pollinator Garden, warns people not to waste their money. He suggests that solitary bee hotels have several problems. They are often manufactured abroad so the holes are too large for bee species that live in the UK. In addition, the boxes may be of poor-quality construction (splinters in the nesting tubes, no solid back so acts like a wind-tunnel) and with tubes made of unsuitable material facilitating condensation and fungal growth. He also states that insufficient information is provided by the seller/manufacturer about long-term management, nor do they make purchasers aware that in some UK locations, the species of bees the hotel was designed for, such as Red mason bees, may not live. MacIvor (2017) has written a detailed review of the existing research relevant to nest box design. He suggests that nest boxes can be constructed using the cavity dimensions of the target species and incorporating both porous and natural materials preferably found locally.

The success of many of the products we review in this article probably tells us a lot about our own species. People want to help wildlife and want to give nice presents, and also want to save time. What could be better than an attractive product, such as the seed balls in a pretty tin, that will result in flowers for bees at no effort, and as noted by many buyers, also makes a great present for a relative/friend who loves bees. However, as one purchaser commented, perhaps the tins are more

of a marketing gimmick, with the reality being that when the seed balls are sprinkled, the hoped for flowers do not come about. Seed balls are not cheap. At nearly £8 including post and packing, you could buy several traditional packets of seeds.

How can product designs be modified to make them better for wildlife? More research, for example, on different bee hotel designs and their success at attracting bees could be carried out. Some factors that are relevant include the location of the hotel and materials used in its construction, the impact of maintenance by regular replacement of nesting tubes in preventing parasitism, and the length and width of tubes (Lee-Mäder, Spivak, & Evans, 2010) that bees seem to prefer in plant stems. However, some products may have little chance of being successfully improved. Bee hotels can provide nest sites for above-ground nesting solitary bees. However, ladybird towers do not seem to fill any real need in the life of ladybirds.

Do potential internet shoppers read the comments or merely scan the product's star ratings on websites such as Amazon? Are most people shopping for wildlife products just looking for a symbolic gift for a family member or friend who is a nature lover, and are not really concerned whether or not the item actually helps wildlife? The description of some of the products we looked at should be a cause for concern. The Consumer Protection from Unfair Trading Regulations (Supplement 28) clearly states that producers of goods may not mislead or harass consumers by including false or deceptive messages. Sadly, it appears that some sellers of insect friendly products appear to bend marketing standards in order to make their goods more saleable. People often buy on the basis of how products make them feel. Buying products claimed to help wildlife probably makes people feel they are doing their bit for nature. Given that millions of pounds are spent on wildlife products each year, with the wild bird feeding industry alone estimated to be worth some £200 million annually in the UK (Supplement 29), it is not surprising manufacturers and retailers are busy trading on this feel-good factor.

Wildlife products are also often bought when visiting actual shops such as garden centres, National Trust gift shops or locations such as Kew Gardens and the Natural History Museum. There is always a risk that the sale of such items in the gift shops or on-line sites of these organisations implies to customers they

have been endorsed by these organisations, some of which do have respected scientific credentials. Perhaps it is time for conservation charities and retailers who promote items to help wildlife to show a little more care when advertising their goods, and for manufacturers to rein in their claims. More research and testing probably needs to be done to examine the design and effectiveness of these products. At the moment it seems that many wildlife products rely more on satisfying the human desire to help wildlife rather than on actually helping. More fundamentally, we might ask whether products alone can help wildlife? Is helping wildlife ever as simple as sprinkling a few seed balls or placing a brick with holes in your garden?

## Supplementary Material


Supplementary material is included for this article at: <http://dx.doi.org/10.1080/0005772X.2019.1702271>.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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