

British beans on toast



Bean developments

A new variety of bean could soon be grown on British farms, one which could be suitable for baked beans, meaning potential new market opportunities for domestic growers. *CPM* explores this homegrown success story.

By Melanie Jenkins

It might be characteristically British, even dubbed an 'essential food' during World War Two, but the bean element of 'beans on toast' is actually imported.

The haricot (or navy) bean is native to the Americas and is part of the common bean family (*Phaseolus vulgaris*), but the commercial varieties aren't suitable for growing in the UK climate.

However, breeders at the University of Warwick have bred several new varieties of common bean that aren't just capable of being grown in the UK, but which

could also open up market opportunities for farmers.

The varieties, Capulet, Godiva and Olivia, are white, blonde and black, respectively, have been bred by Professor Eric Holub, project lead at the University of Warwick.

Versatility

"The objective was to breed a common bean variety for UK consumption and not for export. We wanted to demonstrate the different flavours and versatility of the common bean and to discover these initial varieties to break down barriers in UK cooking habits and thinking," says Prof Eric.

The history of Prof Eric's work started back in 2011, with material being used from the 1970s and 1980s. "This was research that had specifically looked at developing a navy bean for UK farming and the result was a variety called Edmund, which is a parent of Capulet."

Although Capulet was developed through a conventional breeding programme, technically it's different from a navy bean because it's derived through crossed hybridisation from the two origins of navy beans: Mesoamerica (Mexico) and

“ They then might look to cook products grown by UK farmers, creating a market for them. ”



Capulet is a new variety of common bean which could open up market opportunities for farmers.



Capulet is a cross of Edmund and an Andean variety, and was selected so that it could be domestically grown in the UK.

the Andes, he explains. “The varieties were conventionally bred — like with wheat — whereby two parents were chosen — Edmund and the other from the Andean gene pool, which would mean there was a lot of diversity in the offspring.”

Around 5000 F2 second generation plants were selected to be grown on the University of Warwick’s Innovation Campus in Stratford-upon-Avon’s Crop Centre, to determine their suitability to being grown in the UK, such as being tall enough for pod clearance from the ground to allow for conventional harvesting. “Although the varieties are still short, they’re taller than previous ones,” says Prof Eric.

“The plants had to have sturdy stems, and most importantly, had to fit the same growing season as North America. The three new varieties are best drilled in mid-May and ideally harvested in the first week of September, which is around two-three weeks earlier than in Canada and the US.”

Around four years ago, Agrii became involved with the project with the idea that domestically grown beans could help to reduce reliance on imports. This has resulted in both small-scale field trials and the first commercial crop of Capulet being grown, explains the firm’s Rebecca White. “We’re now at the stage where end-users are trialling the beans to see if they can be soaked, and if this is successful, then Agrii will be looking to multiply seed and expand to other growers.”

Although the idea of being able to

supply manufacturers with UK-grown beans to fulfil the domestic consumption demands of baked beans might seem like an outright win for sustainability, it’s one that isn’t feasible at scale. This is because around 2.5M cans of baked beans are purchased every day in the UK, meaning that a firm such as Heinz requires around 300t/day to meet this demand, says Prof Eric. “We can’t compete in this sense, but we can work in unison.”

With this in mind, the team from the University of Warwick and Agrii has been working with Princes — which supplies supermarket canned beans and also owns Branston — to explore the potential for Capulet as a canned bean.

Factory visit

In November 2023, the team alongside farmer Andy Ward, who grew the first commercial crop of Capulet, visited Princes’ factory in Spaling to test the first 10kg batch of the bean through the firm’s kitchen line. This involved soaking and baking Capulet in tomato sauce, which was the next step in promoting the variety. “I hope this will help to create more interest in people eating pulses, so it’s as much about cultural learning and engagement as anything.”

Rebecca anticipates that other producers will follow suit because Capulet offers an opportunity from a sustainability perspective. “Obviously there will be challenges with supply and physically growing them as we can’t expect farmers to stop producing fava beans or peas, but it could be a potential for a premium or niche market,” she says.

Although Capulet won’t replace imported beans, it has the potential to slot



Eric Holub visited Princes’ test kitchen in November where the first commercial crop of Capulet was cooked.



According to Rebecca White, the next stage is to determine whether end users can viably use Capulet before multiplying seed and expanding to more growers.

in the UK market in other ways. According to Prof Eric, samples of Capulet and Godiva have been donated to schools in Leicestershire to increase awareness. “We’re hoping this will get people cooking these beans and recognising their variety names. They then might look to cook products grown by UK farmers, creating a market for them.”

The university itself has created a start-up company specifically to work with growers. “Its main purpose is to create opportunities and start to introduce limited supplies in time for World Pulse Day (10 February). This involves a mix of Godiva and Capulet being sold in waste-free stores in Stratford and Coventry.”

This means that the demand for these varieties should expand in 2024 and Prof Eric hopes to see it scaled up over the next five years. “If there’s interest then farmers will grow these varieties. Agrii has scaled up seed production with the purpose of Capulet being canned with water. It’s early days at the moment and we’re still working on consumer development.”

While Capulet is well on its way to being on dinner tables, Olivia is about a year behind in terms of scale, says Prof Eric. “We’re anticipating a lot of interest from the zero-waste stores and we see Olivia as a replacement for the black bean, whereas Godiva can be an alternative to the kidney or pinto bean.

“We’re breeding beans for consumers, which can both be grown in back gardens and be scalable for on-farm production. We want to help to develop a good system ▶

► that serves public health with diversity and opens up new domestic markets.”

Agrii is now working to explore the consistency and financials of growing these varieties to explore their full potential, says Rebecca. “There’s still work to do to increase the yield, grow a consistent crop and liaise with end users to see how we can all work together.”

Proof is in the growing

Agrii has been trialling Capulet beans for the past four years with the aim to not only multiply the seedbank but to also explore the agronomics and best practice for growing the variety.

Initially, Agrii’s senior trials consultant Justin Burton, started out with 50-60kg of beans with the aim of multiplying them. “In the first year of production we actually fleeced the crop because we were really worried about bean seed fly and pigeons. They all grew nicely and we didn’t have any issues with pests, disease or nutrient deficiency, but we discovered the main issue which was at harvest.

“Capulet grows so low to the ground that a regular combine header just wasn’t going to cut it. It was a lovely looking crop that had podded up nicely with loads of beans on the plant, but when we took our small plot combine through it, we left about 40-50% of the seed on the ground.

“We tried adjusting the cutting angle, going through faster and slower, but everything we did, we couldn’t get better than 40% losses,” he explains. “So that first year demonstrated that we could grow them successfully in our climate,



Capulet grows so low to the ground that a regular combine header just wasn’t going to cut it.



Capulet has proved difficult to combine until the introduction of the MacDon FlexDraper header which is able to combine the crop with minimal losses.

but harvesting was going to be the major issue.”

Problem solving

However, fast forward to 2023 and Justin feels that the harvesting issue has almost been solved. “There’s been lots of trial work along the way and success eventually came from introducing the MacDon FlexDraper header which was a game changer. However, it highlighted another issue — we were getting most of the crop into the combine but because of the light fluffy nature of the ground, we were getting a lot of soil into the combine, which meant trying a different soil type.”

In the second year of trials, Justin coordinated both seed multiplication of Capulet and agronomic growing trials. “We wanted to work out the best way of growing the variety and how to maximise it. We had two trials sites, one at Deeping St Nicholas in Lincolnshire which was ideal for bean growing, and another in Suffolk to test the variety with hotter, dryer conditions, however the soil wasn’t ideal being clay.”

Two different drill dates, three different seed rates, row widths and inoculants were trialled. “Alongside this, we also conducted herbicide screenings which can be an issue with novel and niche crops because we’re pretty much limited to pre-emergence herbicides,” he notes.

By the third year, trials had moved away from the Suffolk site and more in-depth agronomy trials were carried out at Lincolnshire. “By this stage we’d determined a row-width and seed rate we were happy with but repeated these to get further data sets while looking more at drill date.”

Because of the struggles with combining Capulet, the fourth year of

trials moved to Andy Ward’s farm near Leadenham in Lincolnshire. Justin introduced starter fertiliser but admits this didn’t bring any results. However, one thing that did was companion cropping.

“What we wanted was to get Capulet growing taller and more upright, so using an Amazone Precea we planted the bean with black oats. In one row we put the black oats in the fertiliser hopper so they went next to the row alongside Capulet, and in another we recentred the drill so the row of black oats was in between the Capulet row.”

Justin says all through the season the Capulet looked fantastic; it was uniform and upright. “You don’t get expect to see such a good result, but from the off it was evident that the black oats were doing what we’d hoped.

“Admittedly they were sprayed off a little too late at GS37-39, after they’d done their job having produced a structure for the ►



Four years of trials have helped to determine ideal row-width and seed rate for drilling Capulet.

FOCUS NOW ON OVERWINTERED GRASS WEEDS

EXTREMELY CHALLENGING CONDITIONS FOR CROP ESTABLISHMENT IN THE AUTUMN LEFT SOME GROWERS WITH LESS THAN 20% OF THEIR CEREAL AREA TREATED WITH PRE- OR POST-EMERGENCE GRASS WEED HERBICIDES.



Georgina Young
Syngenta Grass Weed
Technical Manager

Coupled with that, successive periods of mild wet weather into the winter triggered repeated germination flushes of dormant grass weeds in wheat and barley fields.

Spring grass weed control strategies using AXIAL® Pro are now a priority to remove competition at the earliest opportunity and enable crops to grow away quickly.

Syngenta grass weed research with NIAB has proven the benefits of an early focus on grass weed removal, to target larger and more competitive overwintered wild oats, ryegrass and black-grass.

In addition to the greater impact on crop yields, these overwintered weeds have also been shown to produce higher numbers of viable seeds at harvest that will perpetuate grass weed populations, compared to later germinating grass weeds in the spring.

Delaying application to later in the spring, to allow more grass weeds to germinate, makes the successful control of the larger overwintered grass weeds harder and more expensive – requiring higher rates and even greater attention to detail to ensure applications hit the target.

Early removal of overwintered grass weeds with AXIAL® Pro, followed by a later application using an alternative non-ACCase mode of action to remove later spring germinating weeds provides a robust resistance management strategy in wheat.

With extreme wet weather this autumn and winter having depleted residual soil nutrients, early weed control can avoid further losses to grass weeds, enabling the crop to make full use of applied inputs.

BARLEY BENEFIT

AXIAL® Pro has long proven a popular option for grass weed control in barley crops. That will be especially valuable for the 2024 season, where spring barley is destined for fields where autumn drilling was impossible or crops have failed.

Spring barley offers an integrated opportunity for effective control of overwintered grass weeds before drilling. However, in-crop control of weeds also remains essential. Syngenta R&D has shown that if left uncontrolled in the relatively uncompetitive spring barley crops, grass weed populations will proliferate.

With rapid growth and development of spring barley crops, AXIAL® Pro has the flexibility for application right through to flag leaf sheath extending stage (GS41) to achieve the optimum treatment timing and hit the maximum number of emerged grass weeds. Where larger grass weeds are present, the application rate to use is 0.82 l/ha.

TOP TIPS

- ◆ Target grass weeds as soon as conditions permit
- ◆ Focus first on areas with larger overwintered weeds
- ◆ Early weed removal cuts seed return
- ◆ Use AXIAL® Pro first in any programme

 **Axial® Pro**

**Confidence
Season after season**



Capulet was planted with black oats in an effort to get the crop to grow taller and more upright.

► beans,” he says. “The MacDon header was again used to harvest the Capulet and this time there was no issue with the soil contaminating the sample and there were minimal losses, especially where we had the companion crop.”

According to Justin, the black oats hadn’t just helped the height of the crop, but with the added biomass the flow into the combine was much better, seeing an average of 0.5-0.75t/ha increase in yield in the companion cropped area. “I think the yield increase might have been even more had we been able to plant the crop sooner, but due to a few obstacles, we weren’t able to drill until 25 May. So this is certainly something I’m looking forward to trialling further.”

Justin plans to further expand on field-scale trials and feels there’s still some fine-tuning to do, with the hope that he can plant 8ha on Andy’s farm this year as well as a crop on another farm too. “This year we’re hoping to expand on the



Capulet should be planted when soil is a minimum of 12°C and there’s ample soil moisture for it to get away and start growing.

companion cropping work and get the drill date right.

“Ideally, Capulet wants to be on a medium-loamy soil and Andy’s soil isn’t quite what the variety wants, being a touch too heavy. I think this was reflected in the yields, but with the nature of the season, the soil probably took longer to heat up than the Deeping St Nicholas site.”

Drilling window

Agronomically, Justin has identified early May as an ideal time to drill the variety. “Aim for then but keep in mind soil temperature and moisture. Soil should be a minimum of 12°C and there has to be moisture there for it to get away and start growing. After this it’s fine if it dries out a bit but initially there has to be sufficient warmth and moisture.”

Site selection is key as Capulet is suited to medium-loamy free-draining soils with a neutral pH, he explains. “It also has to be on flat and stone-free land. Because the variety does require heat and sunlight hours, this means it’s limited to being grown in certain areas of the country.”

In terms of seedbed preparation, Justin advises producing a decent tilth. “It’s not one you’re going to be able to direct drill, and doesn’t like heavy or compacted soil. Drill it to about 5cm depth, depending on the moisture, and at 70-80seeds/m² with row widths of 45-50cm. “In trials we stuck at 30cm but with the Amazone Precea we moved to the wider rows and I feel this is the way to go.”

Weed control is the primary focus with Capulet as it has resistance to seed-borne diseases and fungi. Justin used Praxim (metobromuron) and Dual Gold (S-metolachlor) pre-em in trials, but highlights that there’s also the option of Basagran (bentazone) as a post-em. “If you set the crop up right and have good management, then you should be fine in terms of weed burden.”

Bean seed fly could pose a threat to the crop, so Justin advises looking at cultural controls and time of drilling. “The main thing is to not cultivate anywhere near the time of drilling, so six weeks or more before you go in. You’ll also want a clean seedbed with no weeds and then the fine line between the drill date and bean seed fly activity. We’ve been lucky over the course of the trials and only ever lost as much as 10-20% in one year.”

Bruchid beetle could also potentially be an issue, especially if fava bean are being grown on the same farm, warns Professor Eric Holub. “We’re concerned about



Professor Eric Holub has been working on breeding a new variety of the common bean since 2011, using material from 1970s and 1980s.

bruchid beetle, but by planting in May this appears to be a good way to avoid the serious problems that have been experienced in fava beans. However, this might mean it could be helpful to freeze seed at harvest, to avoid carryover to the following year.”

The work from the trials at the Deeping St Nicholas and at Andy Ward’s farm has demonstrated the potential for Capulet to be grown in different soils. “I thought the soil in Lincolnshire would be heavier than is ideal for Capulet but it appears to work well, so we’re trying to expand in the area. The sandy soils in the Midlands are ideal so we’re working to form a grower cluster here, as well as in South Wales and potentially Cornwall.”

Currently, seed is sent to be cleaned in Lincolnshire and Cambridgeshire, but Prof Eric hopes that if the varieties take off, then further cleaning facilities might emerge.

Scaling up will be the next big challenge. “If Andy were to grow Capulet to his capacity of around 100t, this would likely take five years,” he says. “Optimistically, if Agrii and Andy keep producing for seed, we could have around 1000t of either one or all three varieties, being harvested for consumption by 2030.”

Justin has been involved with niche crops for around eight years and feels that Capulet has already been a real success story. “More times than not, niche crops fail and that’s just the nature of the beast we’re working with, so it’s really nice to have a success story with Capulet. We now know we can grow it so hopefully there’s a push for homegrown proteins and produce.” ■