J. STOKES/SPL

Pinto beans, a Brazilian staple, could soon be resistant to the devastating golden mosaic virus.

AGRICULTURAL SCIENCE

Brazil cooks up transgenic bean

Approval draws criticism over transparency and safety tests.

BY JEFF TOLLEFSON

Paired with rice or steeped in feijoada stew, beans are an essential feature of Brazilian cuisine. So great is Brazil's love of legumes that demand often outstrips domestic supply, forcing the country to import beans from Argentina, Bolivia and China. But this relationship could face the ultimate test as Brazilian scientists roll out a transgenic pinto bean (*Phaseolus vulgaris*) engineered to fend off one of the crop's most devastating enemies: the golden mosaic virus.

Approved on 15 September by the Brazilian National Technical Commission on Biosafety (CTNBio), the transgenic bean uses RNA interference to shut down replication of the virus (K. Bonfim *et al. Mol. Plant Microbe Interact.* **20,** 717–726; 2007). A product of more than a decade of home-grown research, the bean could begin appearing on tables across the country as early as 2014.

"It is an extremely important crop for our small farmers," says Francisco Aragão, a plant geneticist who led the work for the Brazilian Agricultural Research Corporation (EMBRAPA), the research arm of the Ministry of Agriculture, based in Brasilia.

The biosafety commission has taken a favourable position towards biotechnology in past years, helping Brazil to become the world's second-largest producer of genetically modified (GM) crops, behind the United States. Farmers have planted vast tracts of GM maize (corn), soya and cotton with little public resistance, but EMBRAPA is now tinkering with a product that people eat in large quantities every day, says Rubens Nodari, a plant geneticist at the Federal University of Santa Catarina in Florianopolis.

Environmental groups and a presidential advisory panel, the National Council for Food Security and Nutrition, have called for more transparency in biotechnology science and decision-making, and increased research to rule out health risks stemming from the bean. Nodari, a former member of CTNBio who has long questioned transgenic crops, says that the commission improperly granted EMBRAPA's request for confidentiality regarding key aspects of the genetic engineering. "We don't know what we will be eating tomorrow in Brazil," he says.

Current members of the commission have aggressively defended their decision. In a media interview after the decision last month, Edilson Paiva, president of CTNBio, said that Nodari and other opponents of genetic engineering are taking an ideological position aimed at "promoting fear and uncertainty" as they demand that scientists provide the impossible: guarantees of absolute safety.

EMBRAPA says that it must keep core information about genetic insertions confidential, to allow it to patent the work. The details will help the agency to develop bean varieties that are resistant to the golden mosaic and similar viruses, says Aragão, who is a member of CTNBio but abstained from the decision on the beans.

Aragão notes that safety analyses showed no reason for concern regarding the beans. He says that whereas some other GM crops produce unfamiliar proteins that could in theory cause an allergic reaction when eaten, the GM pinto bean produces only small snippets of RNA, tailored to react with and neutralize RNA from any invading virus. Herve Vanderschuren, a biotechnologist at the Swiss Federal Institute of Technology in Zurich, adds that plants naturally produce similar RNA snippets to defend themselves from viral attack, and there is no evidence that this common molecular warfare is dangerous to humans.

With approval secured, EMBRAPA must now conduct a further round of field trials to ensure that the transgenic bean produces yields comparable to those of existing varieties. Aragão hopes that the strain will not only boost yields, but also enable planting on as much as 200,000 hectares of land on which the golden mosaic virus is so prevalent that farmers cannot grow beans at all at present. Brazil produces some 3.5 million tonnes of beans per year already, and Aragão says that the transgenic bean could increase production by 10–20%, enough to offset imports and soften the price spikes that accompany domestic shortages.

"The best part of this story is that the bean was developed in Brazil for the Brazilian farmers," says Vanderschuren, who is part of a consortium working with researchers in Kenya, Tanzania and South Africa to apply the same technology to local crops, including cassava.

EMBRAPA is already looking to develop other virus-resistant beans, including common black beans and the popular carioca bean. "It's very easy to transfer this gene to any other variety," says Aragão. "That's the next step." ■

NATURE.COM
For more on how science can increase food production:
go.nature.com/vt3rqo