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[Allelopathic effects of cultured Cucurbita moschata root exudates]

[Article in Chinese]

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By using the techniques of tissue culture, bio-assay and laboratory analysis, this paper studied the effects of the allelopathic chemicals from pumpkin (Cucurbita moschata) roots on the seed germination and seedling growth of pumpkin, wheat (Triticum aestivum), and radish (Raphanus sativus). The pumpkin root was cultured on a sterile B5 media, and the concentrations of macro- and microelements, organic supplements and hormones in the media were adjusted by using an orthogonal design. After culturing, the culture media was filtered and used in a bioassay to test the autotoxicity and allelopathic effects. The results showed that the pumpkin had both autotoxic and allelopathic effects, and the media having been used to culture the pumpkin roots contained the chemicals that significantly inhibited the seedling growth of wheat and radish. The allelopathic effect decreased when the culture media was diluted. The production of allelochemicals seemed to be related to the growth rate of the pumpkin roots. When the root growth was rapid, the concentration of allelochemicals was high. The allelopathic effect was stronger on radish than on wheat. The optimum concentrations of macro- and microelements, vitamins and hormones for culturing pumpkin root were determined, and the effect of pumpkin root nutrition on the production of allelochemicals was tested. The results indicated that pumpkin root nutrition had a significant effect on the production of allelochemicals.

MeSH Terms:

- Cucurbita/chemistry*
- Cucurbita/growth & development
- English Abstract
- Pheromones/pharmacology*
- Plant Extracts/pharmacology
- Plant Growth Regulators/pharmacology
- Plant Roots/chemistry*
- Research Support, Non-U.S. Gov't

Substances:

- Pheromones
- Plant Extracts
- Plant Growth Regulators

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1: Plant Foods Hum Nutr. 2001;56(4):365-84.

Evaluation of pumpkin seed products for bread fortification.

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Pumpkin seed products (raw, roasted, autoclaved, germinated, fermented, pumpkin protein concentrate and pumpkin protein isolate) were incorporated into wheat flour to produce blends with protein levels of 15, 17, 19 and 21%. Dough properties were evaluated by a farinograph; loaves of breads were evaluated by a taste panel for crust color, crumb color, crumb texture, flavor, and overall quality. Results indicated that pumpkin seed products can be added to wheat flour up to a 17% protein level for raw, roasted and autoclaved pumpkin meal, 19% level for germinated, fermented and pumpkin protein concentrate and 21% level for pumpkin protein isolate without a detrimental effect on dough or loaf quality. On the other hand, the addition of pumpkin seed proteins resulted in increasing protein, lysine and mineral contents compared to the control. While lysine and tryptophan were the first and second limiting amino acids in the control bread, tryptophan and lysine were the first and second limiting amino acids for raw, roasted, autoclaved, germinated and fermented pumpkin meal; valine and lysine and valine and total sulfur amino acids were the first and second limiting amino acids for pumpkin protein concentrate and isolate, respectively. In vitro protein digestibility improved when the pumpkin seed proteins were added.

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Instant Expert: GM Organisms

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John Pickrell

GM Organisms *- Is GM the future? Learn more in our continually updated special report.*

By far the most common genetically modified (GM) organisms are crop plants. But the technology has now been applied to almost all forms of life, from pets that glow under UV light to bacteria which form HIV-blocking "living condoms" and from pigs bearing spinach genes to goats that produce spider silk.

GM tomatoes, as puree, first appeared on British supermarket shelves in 1996 (a different fresh GM tomato first appeared in the US in 1994), but the consumer furore that surrounded GM technology did not erupt until February 1999. This was because a controversial study suggested that a few strains of GM potatoes might be toxic to laboratory rats. Those experiments, subsequently criticised by other experts, were carried out in Scotland by biochemist Arpad Pusztai.

What followed was a European anti-GM food campaign of near religious fervour. Spearheaded in the UK by environmental groups and some newspapers, the campaign would have far-reaching consequences. It culminated in an unofficial moratorium on the growth and import of GM crops in Europe and led to a trade dispute with the US.

GM crops are today very rare in Europe, strict labelling laws and regulations are in place for food (DNA bar codes), and public opinion towards the technology remains largely negative. Several UK government reports have offered qualified support for GM crops and produce, though they argue that the economic benefits of the technology are currently small. Some African nations have also opposed engineered crops, even to the point of rejecting international food aid containing them.

GM produce has been taken up with far less fuss in the US (where it does not have to be labelled), India, China, Canada, Argentina, Australia and elsewhere. However controversy over a type of GM corn - only approved for animal feed - which turned up in taco shells and other products stirred opinion in the US.

Biotech revolution

The human race has methodically improved crop plants through selective breeding for many thousands of years, but genetic engineering allows that time-consuming process to be accelerated and exotic traits from unrelated species to be introduced. But not everyone agrees this is represents progress.

The root of genetic engineering in crops lies in the 1977 discovery that soil bug *Agrobacterium tumefaciens* can be used as a tool to inject potentially useful foreign genes into plants. With the help of that microbe, and other gene-implantation technologies such as electroporation, and gene guns, geneticists have developed a multitude of new crop types.

Most of these are modified to be pest, disease or herbicide resistant, and include: soya, wheat, corn (maize), oilseed rape (canola), cotton, sugar beet, walnuts, potatoes, peanuts, squashes, tomatoes, tobacco, peas, sweet peppers, lettuce and onions, among others. The bacterial gene Bt is one of the most commonly inserted. It produces an insecticidal toxin that is harmless to people.

Supporters of GM technology argue that engineered crops - such as vitamin A-boosted golden rice or protein-enhanced potatoes - can improve nutrition, that drought- or salt-resistant varieties can flourish in poor conditions and stave off world hunger, and that insect-repelling crops protect the environment by minimising pesticide use.

Other plants have been engineered to improve flavour, increase shelf life, increase hardiness and to be allergen-free (see also: hay fever-free grass). Geneticists have even created a no-tears onion to banish culinary crying, and novel caffeine-free coffee plants.

"Frankenfood" fears

Critics fear that what they call "Frankenstein foods" could have unforeseen, adverse health effects on consumers, producing toxic proteins (and allergens) or transferring antibiotic-resistance and other genes to human gut bacteria to damaging effect. But there has been little evidence to back up such risks so far.

More plausible threats are that modified crops could become insidious superweeds, or that they could accidentally breed with wild plants or other crops - genetically polluting the environment. This could be a potentially serious problem if "pharm" crops, engineered to produce pharmaceutical drugs, accidentally cross breed with food varieties (or seeds become mixed up).

Large numbers of field trials, carried out by the UK government and others, reveal that gene transfer does occur. One 2002 study showed that transgenes had spread from US to traditional maize varieties in Mexico. A 2004 study revealed that conventional varieties of major US food crops have also been widely contaminated. Another study proved that pollen from GM plants can be carried on the wind for tens of kilometres.

Many experts agree that insect-repelling plants will also speed the evolution of insecticide-resistant pests. Normal crops are often grown alongside transgenic ones as refuges for the pests, in an attempt to prevent their accelerated evolution into "superpests".

Environmentalists also argue that growing GM crops affects farmland biodiversity. Field trials to test for this have produced mixed results - some suggesting that GM crops actually boost biodiversity.

Growing globalisation

Genetic modification of crops may offer the largest potential benefits to developing nations. However, the growing globalisation of agriculture is a trend that worries some. Activists and disgruntled farmers worry that the agricultural biotech industry is encouraging reliance on their own-brand herbicide-resistant plants (Roundup Ready for example), which could create monopolies.

Companies such as Monsanto or Syngenta protect their GM seeds with patents. In one well-known legal case a Canadian farmer was successfully prosecuted for growing GM canola, though he claimed seed had accidentally blown

Pumpkins

Vanessa Kendell

Cooks in the rest of the world have long made the most of pumpkin's enticing flavours, so perhaps it's time for British cooks to bring this delicious fruit into the kitchen.

In this article

Much like Easter eggs and mince pies, pumpkins only come to people's minds once a year as eerie, sinister-looking lanterns, synonymous with that most mischievous of festivities, Halloween.

Originally an ancient festival rooted in Celtic lore, Halloween was first celebrated by the British and Irish who lit bonfires and carved ghoulish faces out of turnips to scare off the malevolent spirits that were said to be roaming on 31 October. When the Irish emigrated to America in the mid-1800s, pumpkins, which are native to the New World, were more readily available, so the Irish took to carving these extraordinary species instead. The Americans made the Jack O'Lantern an essential part of the Halloween season we now look forward to - or dread - each year.

Cooking pumpkins

Although the British have been quick to take up trick-or-treating at Halloween, we seem more reluctant to see the pumpkin's redeeming culinary features. This hard-skinned, densely-fleshed fruit (strictly speaking a berry), has a wonderful earthy taste but its magic lies in its ability to take on whatever flavours you throw at it.

Roasting the cubed flesh makes for a satisfying supper as does filling pasta with the richly flavoured pulp. The sweeter varieties are perfect pie-fillers and most can be made into hearty soups. Warm spices have a particular affinity with pumpkin, particularly cinnamon, nutmeg and ginger. Herbs such as sage and rosemary also make great marriages.

Denis Cotter, chef and proprietor of ground-breaking vegetarian restaurant Café Paradiso in County Cork, Ireland, is almost evangelical when it comes to pumpkins. In his book, Paradiso Seasons, he says, "It would strain my imagination beyond capacity to produce menus through autumn and winter without pumpkins. Creating dishes from them seems so full of possibilities. The colour alone is reason enough to include pumpkins on a plate".

Buying pumpkins

When we say pumpkins, we're not just referring to the oversized specimens that sit grinning at the greengrocer's. Their watery flesh, what little there is, makes them bland and uninteresting in the flavour stakes, deeming them fit only for a carving fest. For cooking, look out for smaller pumpkins and other winter squashes, such as the bright orange onion squash.

Joan Attwood, from Thrognall Farm in Sittingbourne in Kent, encourages people to be adventurous. Attwood grows and sells a variety of species at farmers' markets in Peckham, London, and in Canterbury. She says, "If you give someone a recipe, they are more willing to have a go, especially outside of London where I find people are generally less adventurous". In London, her pumpkin buyers range from Americans longing for home-made pumpkin pie to Eastern Europeans looking for something more ornamental.

Pumpkin nations

The pumpkin is an autumn staple in many countries. Pumpkin pie is mandatory at Thanksgiving in the United States, for instance. The Italians make it into sweet and sour dishes and risottos, and in Mexico, a certain variety is cooked with local

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brown sugar for breakfast. The French like it in soups, gratin dishes, tarts and in bread.

In Argentina, meat is often cooked in hollowed-out pumpkins for a thick, hearty stew. New Zealanders regard the pumpkin as highly as the Irish regard the potato while in India, a popular variety called Kaddoo, or West Indian pumpkin, makes it into braises and curries. In the Middle East, pumpkin is routinely stuffed with meat, rice and spices, and made into soups and preserves.

Pumpkin flesh is high in fibre and beta-carotene and the seeds are at least as nutritious. Full of zinc and essential fatty acids, these dark green slivers are great roasted with oil, seasoning and spices. In Mexico, ground pumpkin seeds, or pepitas, have been used for thousands of years as a way of thickening and flavouring dishes.

In Austria, a rare species of pumpkin, grown only in the Styria region, has skinless seeds that are made into pumpkin seed oil, renowned the world over for its sweet, nutty flavour. This dark green oil is particularly good in a vinaigrette made with cider vinegar, drizzled on salads and made into a pesto, using pumpkin seeds in place of the traditional pine nuts.

Pumpkin varieties

As well as farmers' markets and some supermarkets, good-quality pumpkins can be bought at Asian and Caribbean greengrocers. Choose pumpkins that feel firm and dense and store them in a dry place. Check frequently for soft patches.

The great thing about pumpkins is that one type can easily be replaced with another in the kitchen. Look out for the following types.

- **Baby Bear –** a very good cooking variety. Sweet and firm-fleshed, these user-friendly small fruit can be baked stuffed with cheese and cream for a single serving. Highly versatile, their pulp is good for both savoury and sweet dishes.
- **Crown Prince –** steel blue-grey with a golden interior. Keeps well and holds its shape. Ideal for roasting and for vegetarian kebabs.
- **Delicata –** small and white with green stripes and pale yellow flesh tasting of sweet potato. Keeps well and has a distinctive nutty flavour. Cooks to a dry texture and is good combined with cream and plenty of seasoning.
- **Onion squash –** bright orange and onion-shaped with soft flesh that is best used in soups or risottos. Only keeps for a few weeks.
- **Small Sugar –** medium-sized fruit with sweet, bright orange flesh. Its high sugar content means it caramelises beautifully when roasted and is a superb pie-filler.
- **Sweet Dumpling –** small and very attractive densely-fleshed white and green squash. Sweet, almost chestnutty taste when cooked.
- **Sweet Mama –** another highly ornamental orange fruit perfect for a single serving. Cut off a 'lid' and bake whole.

Pumpkin recipes

Whatever the variety, pumpkins are versatile and flavourful cooking ingredients. We've selected a few choice recipes - from soups to puddings - to get you started.

Pasta and risotto

Pumpkin pasta with rosemary by James Martin from Housecall
Pumpkin lasagna by Antony Worrall Thompson from Saturday Kitchen
Pumpkin risotto with crispy sage by Hugh Fearnley-Whittingstall

Meaty and veggie main courses

Swiss chard tart with roasted pumpkin and basil by Rosemary Baden-Powell from Masterchef
Wild boar sausage with pumpkin and potato mash and caramelised onion by Lesley Waters from Ready Steady Cook

Snack, soups and side dishes

Roast pumpkin seeds by Antony Worrall Thompson from Saturday Kitchen
Tomato and pumpkin soup by Nick Nairn from Ready Steady Cook
Indian baby pumpkins by Vicky Bhogal from Veg Talk
Sprouts with pumpkin and chestnuts by Holly Jones

Sweet endings

Pumpkin pie by Antony Worrall Thompson from Saturday Kitchen
Pumpkin cheesecake by Holly Jones
Caramelised pumpkin and orange pie by Lesley Waters from Ready Steady

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