



## Some Like it Hot



Chilli peppers are fruit from plants that belong to the capsicum **genus**. The word capsicum comes from the Greek word 'kopto' which means 'to bite'. Capsicums are part of the nightshade family which also includes tomatoes, eggplant and potatoes. Some members of this family contain strong **alkaloid** compounds which can cause death when eaten. Fruit doesn't just mean sweet edible plants like apples or oranges, it means any part of the flowering plant that **encases** seeds and is used as a way for plants to spread their seeds. Even pea pods and corn kernels are classed as fruits. It is thought that chillies originated in Central America and that is why Mexican cooking relies heavily upon them and there are now over 400 different chillies grown across the world. India is the biggest grower, consumer and exporter of chillies.

Chillies may vary in their flavour but they all have a similar **nutritional composition**. They usually contain around 9% **carbohydrates** like sugars and starches, 2% protein, 0.5% fat, 1.5% fibre and no cholesterol. The largest component in a chilli is water at around 86.5%. There are also **micronutrients** found in chillies; Vitamins make up 0.149% and most of this is vitamin C, salts at 0.322% with potassium being greatest, 0.029% is minerals with half of this being phosphorus.

There are three main categories that chillies fall into – bell, sweet and hot. The burning heat of the hot chilli peppers is due to a group of chemicals called **capsaicinoids** (alkaloid compounds), with the main irritant being **capsaicin**. Many people think chillies contain acid and that is why they 'burn' in your mouth but this isn't correct. Your mouth, throat, eyes and nose (as well as any other parts of the body that have **mucus membranes**) contain **receptors** that normally respond to hot things or **abrasions**. The capsaicin compound attaches to these receptors and tricks your brain into thinking that something physically hot is touching you. It isn't actually on fire but your body responds as if it is. Your body releases a rush of **hormones** called **endorphins** which make you feel like you are under attack and this in turn makes you get sweaty, feel pain and your heart rate increases. Some people eat chillies to feel this rush and there are even competitions to try and eat the hottest or most chilli peppers (the current world record for eating jalapeños is 16 in one minute set by an American man in 2006).



The best way to **alleviate** the pain or burning sensation is by using something fatty or oily. These are effective because the capsaicin (fatty compound itself) is **hydrophobic** (hates water) so is attracted to the fat (which is also hydrophobic). The fat absorbs the capsaicin and then it can be removed. Vaseline, cooking oil or moisturiser can be used on the skin surface and in cold milk in the mouth. The milk works because the fats and some proteins in the milk remove the capsaicin chemicals.

Chilli peppers have this hotness to try and prevent damage by fungus. When insects poke holes in the chillies to eat the seeds, they also let in a type of fungus that attacks the fruit, damages the seeds and stops the plant from reproducing. Over time, spiciness has increased in chilli plants because it slows the growth of the fungus and so protects the seeds. This is why most of the capsaicin is found in the white **membrane** around the seeds. The plants that had the capsaicin compounds didn't get attacked by the fungus so reproduced and passed on the genes for capsaicin, making all the chillies hot and as the fungus became used to the hotness, the chemicals had to get stronger and hotter. This is why some chilli pepper varieties are getting hotter and hotter.

Mammals are the only group of animals that feel the heat of a chilli. Birds don't. The receptors in a bird's mouth are slightly different to a mammal's and so when capsaicin compounds attach, they don't send the signals to the brain saying 'your mouth is on fire'. This helps the chilli plant because mammals' teeth are flat and have a grinding motion that destroys seeds when chewed. However, birds don't chew, so when birds eat the chillies,

they **defecate** out the whole seeds. This spreads the seeds away and means that there is less competition between the chilli plants for light, water, nutrients and space.

Chilli peppers are useful in cooking and there are some very famous dishes that have chilli as a key ingredient such as chilli con carne, jerk chicken, curry and hot wings. As well as eating chillies, humans have found other uses for them and the chemical capsaicin that they contain. Some of these are:

- **Medicine:** Creams and patches containing capsaicin are used to treat arthritis pain, back ache and joint pain.
- **Weapons:** Pepper spray is concentrated capsaicin that is used as a non-lethal weapon as it irritates the skin, eyes, nose and mouth, and helps to subdue criminals or rioters.
- **Crop Protection:** In India and Asia, elephants are common pests. They destroy crops and grain stores. Because elephants have such large noses, they are very susceptible to the effects of capsaicin. Farmers use a potent smoke that is made from burning dried chillies and dung to deter the elephants.
- **Bird Seed:** Because birds aren't affected by capsaicin, ground dried chillies are sometimes added to bird seed to stop rodents like mice and rats from eating it.

Chillies vary in their hotness and this is measured using the Scoville scale. This scale was created by **Wilbur Scoville** in 1912. Wilbur was a chemist who worked at a drug development company. He was working on the **piquancy** of different chilli peppers. Human testers are used to determine the hotness of the chillies. The chillies are dried, crushed and soaked in ethanol to remove the capsaicin. This is then given to five panel members in increasing concentrations until three members can detect the hotness. The quicker it is detected, the hotter the chilli. This is not a perfect way of measuring as people's sensitivities differ but it does give a good idea of a chilli's hotness.



Name of Chilli	Scoville Heat Units
carolina reaper	2 200 000
infinity chilli	855 000 – 199 999
scotch bonnet pepper	225 000 – 350 000
bird's eye chilli	100 000 – 225 000
piri piri	50 000 – 100 000
cayenne pepper	30 000 – 50 000
peter pepper	10 000 – 23 000
chipotle	3 500 – 10 000
jalapeño pepper	1000 – 4000
pimento	100 – 900
bell pepper (capsicum)	0

