what fungi do for us – a poem

What are fungi?

- **Living organisms, that most people are familiar with in the form of mould, mushrooms and yeast.**
- **They cannot photosynthesise, instead they absorb their food.**
- **Fungi generally reproduce by releasing spores.**
- **They have great importance in lots of commercial industries.**

There is lots that fungi do for us,

From leavening bread to fuelling a bus.

You might be surprised that you need them every day,

As they have such an important role to play.

We need fungi for fermentation

With it Quorn undergoes a transformation.

Let it grow in the right conditions

And soon you'll have meat free chicken.

Without it fizzy drinks would be in trouble

They need fungi to give them their bubbles

Saccharomyces cerevisiae and Fusarium venenatum

And Aspergillus niger and that's only naming some!

Fungal enzymes have commercial applications,

Without it jam factories would be in a sticky situation.

Pectinases and cellulases save the day

So we can have jam the easy way.

Fungal enzyme laccase improves paper bleaching

And it's starting to look like fungi can do anything.

Fungi even give us "stone-washed" jeans,

Then help make laundry detergent to keep them clean.

Fungi are used for Mycoremediation,

Can decontaminate a toxic situation.

They clean up heavy metals and textile dyes

And might leave edible mushrooms on the side.

Fungi help to produce biofuels,

Powering buses that might take you to school.

Yeast converts sugar to ethanol,

A method with less of an environmental toll.

So I'll just leave it up to you…

Is there anything that fungi cannot do?

bio-stoning

Have you ever wondered how your jeans had that worn, faded look straight from the shop?

That's all down to fungi, ***Trichoderma reesei*** to be precise and a process called **bio-stoning.**

Pumice stone used for stonewashing

Before this was invented, the most common method of wearing denim before sale was stonewashing – washing jeans with pumice stones and allowing the abrasion from them to lift dye particles on the surface of the material. However, this technique is flawed for several reasons. The intensity of abrasion that is achieved using pumice stones is difficult to control, meaning a fair portion of all jeans worn this way are not fit for sale. The rough stones can also easily damage detailing on jeans such as buttons, rivets and zips, not to mention the environmental concerns regarding wastewater and slush (used pumice) disposal.

Fortunately, all of this began to change in 1989 in Europe when a new method, biostoning, began to be introduced. Biostoning uses **cellulase enzymes**, which breakdowns **cellulose,** and only cellulose, and converts it into **glucose,** to artificially fade jeans. It works because the cellulase breaks down the short and exposed cotton fibres that, being plant material, are comprised mainly of cellulose. This process **loosens and lifts the dye particles** on the denim, whilst still leaving the inside of the cotton fibres strong and intact. None of this would have been possible without ***Trichoderma reesei,*** from which the **gene** for cellulase was first isolated. The gene from this fungi with a capacity to secrete lots of cellulase was put into **bacteria suitable for mass production.**

Trichoderma reesei, a mesophilic and filamentous fungus.

There are many **ecological and environmental benefits** of bio-stoning, including an overall reduction in waste, pollution and variation in denim quality – all of which are an issue in traditional stonewashing. Additionally, enzymes are a **catalyst; they don't get used up** and can be recycled. You also only need a very small amount of cellulase compared to the large amount of pumice stones required to do the same job, making bio-stoning much more effective. With 800 million pairs of blue jeans produced yearly worldwide, this really does add up.

So, next time you are wearing your comfiest worn-out jeans, remember to thank the fungi for them.