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Mana Tohu Mātauranga o Aotearoa  
New Zealand Qualifications Authority

## Level 3 Technology 2024

**91613 Demonstrate understanding of material  
development**

# EXEMPLAR

**Merit**

**TOTAL 05**



## Demonstrate an understanding of material development

For this task I need to make a healthy snack option that involves one main ingredient that helps work towards and solve the issue that New Zealand has one of the worlds highest diabetes and obesity problems because of societal change in becoming more reliant on processed snack foods. My alternative healthy snack needs to address the problems around these issues but is also suitable for people with food intolerances and allergies. In addition my healthy snack needs to be available for all New Zealanders and is an affordable option for everyone. The specifications I have been given are that when I design my product I need to prioritise high protein content, minimise allergens and use plant based ingredients as well as opt for minimal packaging. The healthy snack I have chosen is Chia Seed pudding with my main ingredient being Chia Seeds. In this report I will take an in depth look into how chia seeds are developed, manipulated and disposed of in my product as well as their nutritional value and what they have to give for someone facing issues like obesity and diabetes. I will give an explanation on the enhancements chia seeds have on people who have diabetes or are obese. These enhancements are chia seeds are high in fibre, have omega-3 fatty acids which helps reduce inflammation and heart problems people with diabetes or are obese are more prone to and lastly chia seeds are nutrient dense providing essential nutrients such as protein calcium and antioxidants. I will explain how I manipulated the chia seeds in a certain way so that I can use the benefits of their nutrients.

Once Chia seeds are manipulated by a liquid such as oat milk they can become 12 times their size and release a gelatinous residue that has a slightly chewy texture once soaked this makes them easier to digest. Chia seeds in general have many various health benefits and making them into a pudding is a way to enjoy chia seeds more and is also an opportunity to add any other nutrients through adding toppings.

Chia seeds can benefit people with obesity because when added to a liquid like water or in this case oat milk they expand in the stomach causing you to feel more full and fuller for longer helping people maintain healthy weights and not have the tendency to want to eat more. Chia seeds have no contents of sugar whatsoever and are a great option for diabetics as they contain contents of fibre which is proven to reduce insulin resistance and improve blood sugar levels. This means chia seeds and my chia seed pudding will be a great alternative for both obese people and people who have diabetes. Chia seeds offer many various health benefits and have many nutrients to give. The main and most important nutrients they provide is fibre and Omega-3 fatty acids.



### **Development of chia seeds:**

Chia seeds come from a plant a part of the mint family, the *Salvia Hispanica*. Chia Seeds are oval in shape and have a black and white structure which makes it hard to tell the difference between the two types of chia, but luckily they have similar nutrient content so it isn't a huge significance getting them mixed up. The seeds are well known by the name Chia, and originate from Central America where they were a staple in the ancient Aztec diet. The seeds are also related to a plant called *Salvia Columbariae* also known as the gold chia which was used mainly by Native Americans in the southwest parts of the United States. Back in those times Chia seeds were used on their own, mixed into grains or consumed mixed into a beverage. Chia seeds to the Aztecs were a primary ingredient and used medicinally, such as they pressed the seeds for their oil to use for healing, moisturiser and as the base for their face and body paints. Chia seeds can be grown all year round and the leaves can be used as a micro greens and the seeds can be collected once the plant has flowered and is starting to dry. Once seeds are collected from the plant they are dehydrated until completely dry and can fall from the flower.

They have been well known in more recent times for their health benefits and the changes they make when it comes to weight loss. The main chemical components in a chia seeds have been researched by a range of analyzers to what they have found that Chia seeds hold high contents of fats (30-33%), Carbohydrates (26-41%), dietary fibre (18-30%), proteins (15-25%), as well as vitamins, minerals and antioxidants. Chia seeds only really have one they can be manufactured as they don't really have any other purpose unless they are dehydrated. They can be crushed and made into a powder but this does result in them having a very short shelf life due to the reaction when oxygen is involved. When processed and dried out chia seeds have been found to have significant differences in fat, fibre and protein content, this means that being dried out means they have more nutrients to offer instead of coming straight from the plant with no drying involved.

### **Enhancements of chia seeds:**

Chia seeds are packed with nutrients and are known for their various health benefits and great nutritional value. Chia seeds have many enhancements and are a great source of vitamins, minerals and antioxidants. Chia seeds provide nutrients such as Calcium, manganese, magnesium, selenium, copper, iron, and phosphorus. Chia seeds have many different nutrients and health benefits. After doing some research I found the best enhancements chia seeds offer and will have a positive effect on some with diabetes and obesity. These enhancements are that chia seeds are high in fibre, have



omega-3 fatty acids which helps reduce inflammation and heart problems people with diabetes or are obese are more prone to.

#### Fibre:

Fibre is a type of carbohydrate but unlike other carbohydrates our bodies are unable to break fibre down into simple sugars. Chia seeds contain both soluble and insoluble fibre but mostly soluble. The soluble fibre found in chia seeds acts as a bulking agent, assisting in making you feel more full. It also helps your digestive system by influencing faster digestion, it can also prevent disorder while digesting, like constipation and haemorrhoids. The insoluble fibre contained in chia seeds acts as a sponge absorbing fluid making bowel movements softer and able to move faster. The insoluble fibre also helps assist blood sugar levels as it slows down the absorption of sugar, prevents spikes after meals and stabilises levels. The fibre in chia seeds helps provide fullness for obese people and stabilises blood sugar levels for those who have diabetes.

#### Omega-3 Fatty Acids:

Chia seeds have one of the highest sources of omega-3 fatty acids which is normally found in fatty fish, nuts and seeds. Omega-3 fatty acids play a large role in reducing inflammation in the body, brain health, heart health and in general benefitting overall well-being, cardiovascular and cognitive functions in the human body. Per tablespoon of chia seeds contains 2.50g of omega-3 fatty acids which daily people should be getting 1.1-1.6g everyday. Alpha-linolenic acid (ALA) also known as omega-3 acids. ALA cannot be produced by the body, and is crucial to have as it helps digestion and creates energy as well as being known to decrease the risk of heart disease. Omega-3 fatty acids can benefit someone with diabetes as the omega-3s enhance insulin sensitivity assisting the body to use glucose more effectively and manage blood sugar levels, which is important for a diabetic. Omega-3s found in chia seeds can help with weight loss as they promote fat oxidation and play a role in reducing appetite making an impact on someone with obesity as it plays a role in managing body weight. Omega-3 fatty acids help improve cholesterol levels and reduce the risk of heart disease, which is common with those who have diabetes and obesity.

#### **Formation and manipulation of chia seeds in chia seed pudding:**

Chia seeds don't have a lot of overall purposes and are simply well known after going viral on social media platforms and now are commonly used for their nutrients, health and wellness benefits when in a pudding form or mixed with a liquid. But after a study was conducted using the microbiome of pigs with their similar digestive system to humans, the study showed that chia seeds are best ground instead of whole. The study found that people weren't wasting time eating them whole but just that the external fibre can shield nutrients from being released and absorbed in the body. The reason for ground chia seeds not being popular or on shelves at supermarkets is simply because they should only be ground right before the time of ingesting them as the exposure of

oxygen causes smelling, so grinding them in bulk amounts to leave for longer periods of time results in bad flavours and smells.

Once making my chia seed pudding twice, it became apparent early on that chia seeds are a very simple and adaptable product. I tried making my chia seed pudding twice to ensure I got the most knowledge by seeing the product for myself. Over these two trials I realised that the chia seeds performed the same both times and that I was able to get the same results every time. The second time trialling I added the almond butter into the milk and chia seeds instead of on top. This didn't change much in the respect of having an effect on my product or the way the chia seeds soaked up the liquid. The second trial I made some minor changes to my amounts of ingredients. I did this to make the pudding slightly bigger to ensure that when eating I was able to get more of the benefits chia seeds gave. I noticed that the amount of liquid (in my case Almond Milk) didn't really matter and as long as I put at least double the liquid to the amount of chia seeds I was able to get the seeds to reach their full potential but it didn't matter if I put more in it just depended on how thick/runny I wanted my pudding to be.

First trial:

Used 10g of chia seeds = 1 tbsp

30g of oat milk

Second trial:

Chia seeds - 15g

Almond milk - 100g


Almond butter - 22g

One thing I changed from the method of the recipe the second time I made chia seed pudding was combining the almond butter into the milk and chia seeds instead of putting a dollop on top. This worked better because the almond butter and chia seed mixed together well as the almond butter also helps with bringing blood sugar levels down as well as adds extra nutrients such as potassium and vitamin E which chia seeds are full off. Adding the almond butter in with the chia seeds while they soaked ensured that all the nutrients could combine together and all important nutrients were able to be absorbed when eaten.

**Impact on maintenance and disposal:**

Chia seed pudding is best when refrigerated and is at the desired consistency, chia seed pudding can last up to 5 days if refrigerated and will continue to thicken until the seeds have reached their full potential at 12 times bigger than when they are dry.





While refrigerated it is possible to add more milk to keep the consistency as desired which depends fully on the consistency you want and like. The pudding is best kept in an airtight container or jar, which in my case I used a jar as I found it was sustainably correct, reusing/repurposing a jar and being able to use it many more times for various things. Chia seeds preserve well because once a liquid has been absorbed and the gel-like consistency has formed, it helps the pudding stay stable and fresh for a longer period of time. Chia seeds are organic and therefore do not require any safety regulations but are to be disposed of after 5 days, this would only change depending on the liquid used to form the pudding. In my case I used unsweetened protein almond milk which has a longer shelf life than normal cows milk. Despite the longer shelf life, Almond and organic milks do still expire, when past used by date almond milk can appear still lumpy after shaking and has a bad smell resulting in the milk tasting sour. Almond milk still has safety regulations that need to be checked before consuming, but not as high risk as cows milk. In terms of disposal, chia seeds should not be put down the sink, maybe one or twice when there is a small amount of wastage but if large amounts go down the drain, because of their absorbing properties it results in them tending to clog drains and pipes. A way to improve sustainability and organically dispose of chia seeds is composting. By composting your wastage chia seeds, putting them in the compost results in many positives. Chia seeds have proven to have many health benefits but they also have great composting benefits, putting wastage chia seeds in your compost bins will add great values of nutrients and by adding them to organic waste maintains a balanced carbon-to-nitrogen ratio in your compost heap. Disposing of your seeds this way is a sustainable and anti-problem causing solution.

To conclude this report, the natural ingredients of chia seeds offer many different benefits to anyone, but are a great thing for people to consume if they have diabetes or are obese. Although chia seeds can be consumed in many ways I choose the product of chia seed pudding as it is an easy, and yum way to eat chia seeds as well as a way you can extract all the nutrients and benefits chia seeds have to give. Chia seed pudding is a great way for someone with diabetes or obesity to consume as their benefits are great and work well with improving their lifestyle. The ingredients I paired with the chia seed pudding were great options as they had minimal/no sugar and were a healthy alternative to other ingredients. Adding berries to the pudding is a healthy way to add flavour and nutrition, and the almond butter was a great alternative to the classic peanut butter but having better nutritional value in the sense of fats for those with diabetes and obesity. Overall chia seeds are a healthy food option for everyone but in particular those struggling with diabetes and obesity.

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## Merit

**Subject:** Technology

**Standard:** 91613

**Total score:** 05

Q	Grade score	Marker commentary
One	M5	The candidate refers to a product and how the material enhances its performance. This is done, through an in-depth analysis of development, enhancements, formation, manipulation, and lifecycle.