

R-SHAPED BACK SUPPORT CUSHION USING COIR PITH

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ABSTRACT:

The Poor posture of a bedridden patient can affect the physical and emotional well-being and can also disrupt the sleep. In addition to exaggerated tension, poor circulation and neck pain, they may conjointly experience emotional tension associated with chronic pain. The stress on spinal cord, neck and shoulders can be minimized by resting with help of a supporting medium. The supporting medium in this paper is made of coir-pith. Coir pith is an organic fiber which is of biodegradable. This raw material is made into a solid back cushion of R shaped with help of the molding process. It is of low cost and healthy compared to the existing product made of chemicals using foam process. The product is also useful for pregnant ladies to maintain their posture while sleeping without any uncomfortable feel. This is mostly helpful to recover quickly from spinal cord injuries. This paper suggests that coir pith can be one of the alternative raw materials which can be applied for packaging purpose to reduce the environmental hazardous products in medical supporting medium for back.

INTRODUCTION:

At present demolishing of nature and promoting plastics and other toxic materials are increasing. Thus, a small way to create awareness about it is coir pith cushions. Coir fiber is normally extracted from outer layer (husk) of coconut tree. The cottage industry in India where Tamil Nadu, Andhra Pradesh, Orissa, Karnataka, Maharashtra, Goa, Kerala, Assam and Pondicherry the counts are more [4]. Kerala is considered as the largest producer of coconut up to total land area of 38,863 sq.km. It is mainly used for housing, building agriculture and infrastructure development. Since husk contains waterproofing layer, it is strong and highly resistant to abrasion. It mainly supports important health factor such as back pain. The Canadian statistics says 19% of the workers are affected from back pain and lose 6 hours of work in a month. This is also generally regarded as eco-friendly and pollution free kind of production. The strategy says that existing workers would be employed creating additional employment opportunities to the unemployed.

LITERATURE REVIEW:

Diane E Grondin, John J Triano, Steve Tran & David Soave, 2013 has presented a paper titled "The

effect of a lumbar support pillow on lumbar posture and comfort during a prolonged seated task". In this paper, they explain about the cause of the modern-day task become to decide whether or not a lumbar guide pillow, geared up with a reduce-out to deal with the bulk of posterior pelvic gentle tissue volume, is more effective than a popular chair in promoting a neutral spinal posture and improving subjective and goal measures of consolation in healthful individuals and sufferers with low returned pain. A lumbar aid pillow with a reduce-out for the posterior pelvic tissues advanced an objective measure of comfort in wholesome people and sufferers with low returned ache. Lumbar pulling down turned into decreased and thoracolumbar curvature turned into improved. But angular adjustments had been small and destiny paintings is needed to decide scientific relevance over the long time. [1]

Fangyi Li et.al, 2014 has presented a paper titled "Ingredient of Biomass Packaging Material and Compare Study on Cushion Properties". It deals with the biomass-based cushion manufacturing with the use of coir. Several experiments and mathematical calculations are done to define the quality of the coir. One fine experiment named infrared spectrum is done to test the strength of the coir. [2]

Bundit Prommanon et.al, 2015 has presented a paper titled "Effectiveness of back care pillow as an adjuvant physical therapy for chronic non-specific low backpain treatment: a randomized controlled trial". In this paper they states the effects of low backpain and the use of back care pillow to reduce the pain. This is due to the stiffness, soreness and tension in lower back region and it is difficult to identify the specific cause of pain. It is made by diagnosing the people of different ages and the intensity of pain is noted. Physical therapy can provide large number of benefits to reduce the lower back pain. This paper explains about the back-care pillow which supports the lumbar spine and helps to prevent the symptoms for lower back pain. [3]

Dr. Das Anitha Ravindranath et.al, 2016 states the origin of coconut husk production and the manufacturing of coir is explained in a detailed manner. we came to know about the husk of immature coconut is valuable for the manufacturing of coir. The temperature difference in the testing of coir helps us to know about the quality and strength of the coir. [4]

(M. C. Melo, D. R. Macedo, A. B. Soares & S. Krishnan, 2017) explains about spinal cord injury (SCI) The Importance to realize SCI is due to its excessive societal and financial effect. The better understanding of SCI allows the introduction of prevention programs and directs the studies to the improvement of latest technology and development of the existing ones. [5]

COIR PITH:

Rich source of any product is known to be coconut. The husk of coconut is said to be raw material for these industries. The culture of coconut is been there for more than 4000 years. Fiber which is recovered from the coconut pulp is known as coir. Most popular uses include coir mats, textiles, ground covers, mattress etc., these are derived from two ways. One is from ripe or immature coconut husk. These are highly, strongly resistant to abrasion. Another is in form of white color which is taken before ripen.

The coconut husks are mainly change to carbon and activated carbon and used in filtration systems. For the preparation of coir pith the husk is

taken to fiber mills and coir fiber extracted. A coir dust which is spongy material is taken up to 50-70 percentages. Husk of 10000 coconuts are used and 1.5 tons of coir pith is acquired. [4]

Properties and Constituents of Coir Pith:

Major constituents of coir pith are lignin, cellulose and hemicelluloses. An amorphous polymer of phenyl propane is lignin. It is surrounded by cellulose and hemicelluloses. The decomposition of material is very slow since it contains pentosan and lignin in ratio of 1:3. Lignin and coir pith are combined together and gives structural function.

Properties

- Coir pith has high capacity of water holding up to 6-10 times its weight.
- Magnificent moisture maintained even after drying.
- Slow humilation due to high lignocellulosic bonding.
- High porosity stores and allow to leave nutrients over expand period of time.
- Substantial physical resiliency that resist finer compression.
- Outstanding aeration/oxygenation supply increased root penetration.
- Bearable electrical conductivity (EC)
- Contains natural substances beneficial for plant growth

Design:

The software used to make our component is **CATIA version 5 R21**. CATIA is a design software tool to make design, simulate, and analyze the product in a variety of industries. All the components and sub components of any products can be designed using this software. It is a user-friendly software.

Procedure:

R- Shaped Cushion:

To make this R-shaped Cushion in this paper we used some design steps to make the model

- Sketched the right face of the solid component in ZY-plane using the dimensions height as 80mm and length as 50mm, the curve radius as 10mm by using the spline curve option
- The above cross section is extruded along X-axis for 150mm using pad command

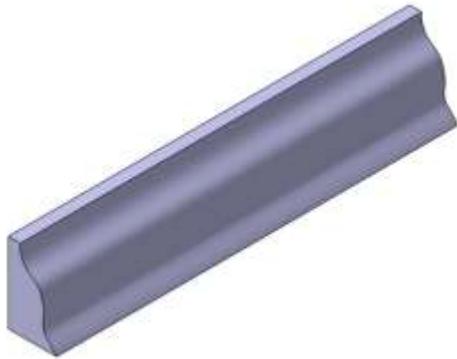


Fig1: R-shaped Cushion model

Material Processing and Methodology:

Raw material:

The main raw material used is Coir pith: 60 mesh. corn starch: average particle diameter about 70nm: ammonium bicarbonate, stearic acid, glycerol, ethylene glycol and so forth. Coir pith act as the main bearing carrier of force, just like a framework. Cornstarch, the mass quantitative relation of that is that the highest, plays a vital role in filling and bonding with fiber and different additives. Ammonium hydrogen carbonate because the foaming agent is employed to come up with the bubble microporous structure. Glycerol and ethylene glycol, as the plasticizers, plasticize the starch in order to improve the adhesion property with plant fiber. Other raw materials square measure primarily used for higher quality of product molding.

The process is isolated into four parts: fiber fibrillation, starch plasticizing, additives and molding.

(1) Fibrillation treatment of pre dried fiber was carried out after fiber was soaked in 5% (W/V) sodium hydroxide aqueous solution for 3 hours. Beat the fiber

until the quality of devillicate then the fiber should be rinsed clean and dried. Fiber fibrillation was to expose more active hydroxyl groups so that the hydroxyl groups could combine more easily.

(2) Starch and water were mixed by the mass quantitative relation of 1:4, and then the starch was gelatinized after adjusting the temperature of the thermostatic water bath. While churning, the compound plasticizer, ready exploitation glycerol and synthetic resin glycol consistent with a given volume quantitative relation was another in. The starch could be plasticized efficiently. As a result, higher compatibility between starch and fiber and higher physical science property of the suspension were obtained.

(3) place the fiber once beating fibrillation treatment and plasticized starch into the mixer. After 20 minutes churning, foaming agent, surfactant and other additives were added in and mixed up until homogenous.

Method of Composting Of Fiber Pith (Conventional Process)

As reported by this method pith is collected in an exceedingly multilayered structure, where the non-identical pith layers are scattered with pith plus mushroom and organic compound. A schematic

- (a) Pleurotus sajor caju - Culture on personal digital assistant
- (b) plant organ in natural state pith plus, coir pith, urea, coir pith.

Sandwiching method of composting of fiber pith with Pith plus and organic compound Coir Pith Wealth from Waste a Reference -28- diagram of such a manifold structure is shown in figure. The primary layer of pith is shield with a sheet of pith plus. The surface of pith plus supply the mandatory cellular organisms to biodegrade the fiber pith. The main layer of fiber pith is glazed by second layer of fiber pith followed by organic compound. Organic compound supply's the mandatory nutrient media to multiply the expand of PITHPLUS that close up in the humiliation of fiber pith. The urea layer is eventually completed by a surface of pith and pith plus severally. The

method is carry on till the top of the heap extend a most of one.5 meters. The wetness in the heap keep going at 2 hundredth by scattering water at periodic intervals for thirty days. The mass of fiber pith is step by step reborn in to organic manure that is dark colored and improved with element, element and metallic element (NPK) and micronutrients.

Physical Parameters

The coir pith could not be decomposed and not more than 2 years old. Good cushion nature satisfies only when the coir is 'golden brown' in color. An important condition is that it should have the quality of observing water and resistant to other dusts and wastes. Above all these conditions it should be free from weeds and husk.[1]

Chemical Parameters

Following the removal of coir pith the husk is immersed in clean water and it is collected. It should be noted that the water soaked should not be hot water because it loses its property. The electrical conductivity should be below 0.5ms/cm [1]

Environmental Impact

The degradation of coir pith is very slow and it residue in soil forever, but the level of effect or harmfulness is decreased [2]. The environmental pollution due to coir hillocks is reduced due to this method. The nature of coir is less weighted and makes the transportation very easy. The difficulty exposed due to disposing the waste produced in coir fiber mill is now reduces by this method. It can be converted to valuable organic waste and thus maintains the fertility of the soil. If the quantity of coir accumulation in the soil increases the chemical property of the soil is changed and the formation of toxicity is generated [2]

Coir pith is start to have a higher value at 3975 kcal/kg when compared to rice husk saw dust etc. the only disadvantage is that it produces large amount of carbon dioxide due to poor combustion property. Pith is collected after the coir fiber is extracted. The number of steps is performed for the extraction based on the requirement of consumer. Chemical contents like tannin, phenol, carbon, nitrogen is used for the processing the coir pith. The first process is sieving of

pith to remove unwanted waste which will spoil the strength of coir pith. The next is washing it with water to remove the excess salt content. In this manner simple coir board is made in an efficient way.

The Effect of Lumbar Support using Coir Cushion

This is considered as the most important health factor for low back and chair support in seated work stations. The result of these musculoskeletal condition cause reduction in attendance [1]. It has been identified that development of low back pain is caused for those who are required to sit for the whole day. The reason is that the contraction of muscle for a long time causes irritation and pain in that particular portion. This changes the intravertebral disc pressures. The natural Lordotic curvature is maintained to minimize the lumbar pressure. Precautions are made for seating postures to avoid this kind of problems. The patients could not explain their comfortless whether it is a long-term effect or not. Investigations were made and additional symptoms are found with solutions.

Measured the biomechanical effects and luxury levels once employing a body part support cushion that inflated from zero.5 to 8.0 cm thick in a very continuous passive motion chair. They noted vital enhancements with in the subjective measures of LBP, stiffness and fatigue with the use of the system in each static and dynamic states. It's noted that whereas a body part pad activity 9 cm thick best maintained the body part hollow-back in sitting, N participants cared for complaint that it pushed their body forward, the result being a center of pressure (CoP) that was a lot of anteriorly settled on the seat pan [3]. in their study, participants additionally according that configurations with less hollow back (i.e., but 3 cm) were easier. Movable devices that don't account for the majority of posterior girdle soft tissue volume might push the lower body forward and deform the supposed relationship between the seat pan options and also the body

The preferred degree of hollow-back could also be associated with the pain state of the individual, in this comfort could also be full of the angular modification similarly because the interaction between the buttocks and also the seat pan [1]. Where as the past authors have usually measured comfort through subjective means that, objective

measures like changes in posture (or 'micro movements') could also be sensible indicators of discomfort, as little movements are necessary to alleviate pain caused by static postures. Where as many past studies have examined the results of assorted body part support pads, few have quantified the extent of comfort through 'in chair movements', and most studies are restricted to healthy people. The aim of this study was to look at for variations in dipped curvature and luxury between a support device that accounts for girdle tissue bulk against a typical chair in healthy people and patients with LBP. Comfort was measured through subjective and objective means that. The hypothesis underlying this work postulates that there'll be variations in comfort and dipped angulations for healthy people and patients with pain between the support conditions.

CONCLUSION

Thus, the implementation of coir cushion is made which are potential agents for biological decomposition. The extraction of coir fiber leads to accumulation of coir wastes and environmental pollution. Bio degradation of coir pith is reduced by this method. Through comparison of the cushion performance and the rebound performance of the biomass, comfortable for the patients.

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