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Review on Design and Development of Marigold Flower Petal Separating Machine

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Abstract-
A marigold flower petal separating machine has been fabricated. The machine is fabricated for separating flower in two different parts, upper part consist of petals and lower part consisting of seeds. This project focuses in design fabrication of mechanical part of machine and the system of petal and seed separating machine. To achieve this project objective, the machine body structure and the mechanical system need to analyses some other criteria such as performance, strength, safety, and ergonomic design. Design of Model (Mechanism). Fabrication of Model setup as per CAD or CREO design. Conducting Experiment on the Model setup. Results and discussions. Conclusion as per results. After testing and obtaining results the conclusion of project will be done and put to use.

Keywords: machine, cutting, seeds, mechanism, cutter, tray, motor, etc.

I. Introduction

A Marigold flower has a very important and prominent place on any occasion of celebration, marriage ceremony, festival or any other function. Because of this major part of the flower, waste is generated especially from the temples. When this flower are collected in large quantity, it make very difficult to manage such large quantity of flowers. These flowers are collected and utilize for better purpose, they are needed to be converted into compost by separating seed from it. In addition, oil is extracted from the seeds of marigold flower and is used for medicinal purpose. In this project, we describes the design based on the separating operation of the seeds and petals of marigold flower. Machine uses the 'belt and pulley drive mechanism.

The purpose of mechanism is to separate the seeds from flower in downwards direction while the blade cuts the flower. This machine can provide above 95% of cutting efficiency. For this, we work on cad model of machine with the help of cero parametric 3.0. Flat belt is operated by the rotor of gear DC motor at the speed of 60 rpm and cutting blade is rotated with the high rpm DC motor which is rotating at 4000 rpm. After finalizing the mechanism, we attempting various experiments on the machine. During the process if any flower comes out of the machine uncut, the machine, resulting in the increase in accuracy of the machine, can still report it.

The aim of this project is economically feasible and we are under the impression that it can be further reduced, when it produced on large scale.

The marigold flower petal separating machine represents a significant advancement in floral processing technology, revolutionizing the way petals are extracted from marigold flowers. This specialized equipment serves a vital role in various industries, including herbal extraction, crafting, and floral arrangement, by automating and streamlining the petal separation process. At its core, the marigold flower petal separating machine is engineered to delicately detach petals from marigold flower heads with precision and efficiency. Unlike manual methods that are time-consuming and labor-intensive, this machine employs innovative mechanisms to achieve consistent and high-quality results. One of the key features of the machine is its gentle handling of the delicate marigold petals. Through a combination of vibration, airflow, and specialized sorting mechanisms, the machine ensures that the petals are separated without causing damage or bruising. This is crucial for preserving the integrity and visual appeal of the petals, making them suitable for various end uses.

The efficiency of the marigold flower petal separating machine is unmatched compared to manual separation methods. With its automated operation, the machine can process a large volume of flowers in a fraction of the time it would take manually. This not only saves valuable time but also reduces labor costs, making it a cost-effective solution for businesses.

In herbal extraction, the machine plays a vital role in obtaining marigold petals for their therapeutic properties. Marigold petals contain compounds such as flavonoids and carotenoids, which have anti-inflammatory, antioxidant, and antimicrobial properties. By efficiently separating the petals, the machine facilitates the extraction process, allowing manufacturers to produce herbal extracts and essential oils more efficiently.

In conclusion, the marigold flower petal separating machine represents a game-changer in floral processing technology. Its ability to efficiently separate petals from marigold flowers with precision and gentleness has wide-ranging applications across industries. From herbal extraction to crafting and floral design, this machine streamlines processes, enhances productivity, and delivers high-quality results, making it an indispensable asset for Businesses and enthusiasts alike.

II. Literature Survey

Shrimp-cutting machine for cutting intermediate joints Derrell Sawyer
An apparatus for cutting a shrimp body, the shrimp body having a tail portion that includes a plurality of tail sections connected by joints. A motorized driving mechanism mounted inside a housing drives a cutting mechanism mounted outside the housing. The cutting mechanism includes a rotating cutting disk and a holding and carrying mechanism configured to securely hold the shrimp body and carry the shrimp body past the rotating cutting disk. The holding and carrying mechanism is configured to position the shrimp body in relation to the rotating cutting disk so that when the cutting disk cuts the shrimp body, the cutting disk leaves intact, a first joint at a head end of the tail portion and a last joint at a tail end of the tail portion, while cutting at least one intermediate joint between the first and last joints.

Automatic boning system of upper half of slaughtered edible fowl Fujiwara Yoshimitsu
An automatic boning system of the upper half of a slaughtered fowl is provided, in which the number of processing steps is decreased, integrated control using cams is adopted instead of individual control of prior art using hydraulic actuators, and an improvement in yield is achieved. The automatic boning system of the upper half of a slaughtered fowl comprises a main intermittently stepwise feeding section (11), a group of eight stations, and a cam mechanism (14). The main intermittently stepwise feeding section (11) comprises a rotary disk (12) which is rotated intermittently stepwise at an angle of 45° by means of a stepwise driving device (12a), and eight attachment cones (13) located on the peripheral part of the disk (12) at a spacing of an angle of 45°.

Design and Fabrication of Automatic Cutting Machine Ankit Patnala and Manas Rajan Patra
The project undertaken is about the design and fabrication of a machine known as the motor driven cutting machine for food items. This machine was made with the intention of helping the fish sellers or also making the household task easier. This machine mainly comprises of two mechanism, i.e., Crank-Rocker mechanism and the Scott-Russell mechanism clubbed together. A motor input was provided to drive the crank. The Scott Russell then came into the picture with the desired blade movement that led to the subsequent cutting of the food items. This project was actually designed to benefit the fish sellers by increasing their productivity. There, it takes a long time to cut fishes so this mechanism would prove to be both handy as well as affordable for the fish sellers to cut the fish quickly and appropriately. Since the machine as fabricated in wood, it was light weight and portable.

Marigolds are cultivated widely in the Asian and African regions with higher adaptability and are used as cut flowers, loose flowers, and pot flowers. However, the most preferable type is loose flowers in many countries. Especially in India, they are extensively used for social and religious functions in the form of gajra and a variety of garlands. India began as the land of deities, and offering flowers has great value in worshiping the deities; this, in turn, generates a lot of floral waste. During the festive season, marigold flowers are specifically offered to many deities as offerings in favor of blessings [1].
After offering the florals to the deities, the flowers complete the purpose of worshiping but lose their value and are then treated as waste, collected with other waste before finding their way to be dumped in water bodies or with other waste and pollute the environment. Numerous beneficial, small-scale products can be manufactured with these flowers [2].

The African marigold is a medicinal plant cultivated almost everywhere; for example, one of the species of marigold is Tagetes erecta, grown in Africa. There are 33 different species of Tagetes, whereas, among the 2 most common types, the French marigold is the name given to Tagetes patula, and the African marigold to Tagetes erecta [3].
Tagetes patula, a species of flowering plant, is a native of Mexico and Guatemala with a wide naturalized population in various countries. The cultivation of marigolds depends mostly on many factors, including crop management, seed and soil quality, time of year, latitudes, etc. [4].

Tagetes spp. contain some phytochemicals and nutraceuticals that can be used to cure eye-related diseases (such as cataracts and age-related macular degeneration (AMD)), cardiovascular diseases, cancer, etc. The petals of marigolds contain a high level of lutein content (oxygenated carotenoid xanthophyll) and are used as coloring agents in the food and feed industries, as well as being used for antioxidants [5].
Carotenoids and polyphenols are considerably found in marigold flower petals, where lutein esters are a major component, which accounts for 70–79% of the total carotenoids [6,7].
Researchers are paying more attention to this ornamental plant due to the presence of bioactive compounds and its enormous therapeutic potential, especially in reducing the probability of macular degeneration [8].

Carotenoids are the most abundant and re-occurring pigments found in all families of plants, as well as animals. There are about 1100 known carotenoids, and various studies have provided proof that about 50–60 available carotenoids from different sources of consumption are beneficial for the human body. Khachik et al.
[9] isolated, studied, and characterized three carotenoids, namely lutein, zeaxanthin, and lycopene. There are many sources for lutein and zeaxanthin, but the most economical sources are marigold flowers and lycium chinense mill berries. In marigold flowers, lutein is a major carotenoid accompanied by 3 to 6% zeaxanthin and is present in esterified form with fatty acids such as palmitic acid, myristic acid, and lauric acids. Major lutein-rich foods are spinach, grapes, egg yolks, kiwi fruits, zucchini, squash, kale, and corn. Lutein is a major xanthophyll (70–88%) that occurs in marigold petals [10].

III. Problem Identification

- Marigold flower has a very important and prominent place on any occasion of celebration, marriage ceremony, festival or any other function.
- Because of this major part of the flower, waste is generated especially from the temples.
- Normally, we garland or offer flowers to almighty while worshiping. After 24 hours they are removed and thrown. It is called Nirmalya.
- In the process of throwing the flowers' waste is not segregated and take a form of filth that smell very bad.
- City College has come up with a solution that can become a part of waste management of flowers.
- The machine can separate petals and seed of the Marigold Flower, thereby, paving the way for efficient management of flower waste in India.

IV. Aim & Objective

1) Aim: Design and Fabrication of Machine for Separating the Seeds from Flower.
2) Objective: To Decide and Design the Separate Components of Machine.

V. Methodology

- Design of Model in Software: After making the experimentations & calculations as per our requirements, we tried to imitate the real product in CREOPARAMETRIC 3.0.
- Motion Verification: Using kinematics and stimulation section in CREO we were able to verify whether the path traced by the disc is meeting our requirement or not.
- Fabrication: After getting the desired output in step 2, we started manufacturing each part of desired shape in mild steel material. We fabricated the pressure plate according to our requirements.
- Assembly: Proper assembly of the fabricated parts produced in step 3 with the help of bolts, nuts, washers and more.
- Modification: Some fallacies were observed after the assembly while in motion due to dynamic instability. In order to make it stable we had to modify our design either by changing equipment or by adding a new part.
- Completion: After various modification we have got the 100% success in cutting the seed portion and petal portion.

VI. Block Diagram

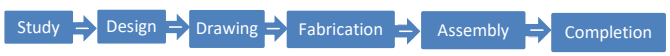

Fig: Flow chart for fabrication of Marigold flower seed and petal separating machine.

VII. Conclusion

Based on the comprehensive review of existing literature and research on marigold flower petal separation machines, we have decided to proceed with the design and development of our own machine. This decision is motivated by the identified need for an efficient and effective solution to streamline the petal separation process, improve productivity, and reduce labor costs in the marigold flower industry. By leveraging insights gained from the literature review, we aim to create a machine that addresses the limitations of current methods while incorporating innovative technologies to achieve optimal petal separation performance. Our conclusion underscores the significance of this endeavor in advancing agricultural automation and meeting the evolving needs of the marigold flower production sector.

References

[1] "SHRIMP CUTTING MACHINE FOR CUTTING INTERMEDIATE JOINTS" By Derrell Sawyer, Caddo Mills, TX,(US)

[2] "Automatic boning system of upper half of slaughtered edible fowl" By Fujiwara Yoshimistu, Tokyo 135-0046(JP)

[3] "Design and Fabrication of Automatic Cutting Machine" by Patnala Ankit and Manas Rajan Patra, Bacholar of Mechanical Engineering, National Institute Of Technology, Rourkela

[4] P. G. Mehar ,A. V. Vanalkar ,Dr. S. S. Khandare " Force Evaluation Of Integrated Bamboo Processing Machine And Performance Of Dies" 1st International and 16th National Conference on Machines and Mechanisms (iNaCoMM2013), IIT Roorkee, India, Dec 18-20 2013.

[5] Adarsh J Jain, Shashank Karne, Srinivas Ratod L, Vinay N Thotad and Kiran P" Design and Fabrication of small scale sugarcane harvesting Machine" ISSN 2278 – 0149 Vol. 2, No. 3, July 2013.

[6] Industrial Design and Manufacturing of a Manual Driven Low-Cost Banana Slicing Machine" By Johny Damian. Anak Tawi.

[7] "Theory of Machines" By Khurmi and Gupta.

[8] Bernal, M.P., Paredes, C. and Sanchez-Monedero, M.A. (1998). Maturity and stability parameters of composts prepared with a wide range of organic wastes. Bioresour. Technol.

[9] Bhuyan, R. and Saikia, C.N. (2004). Isolation of colour components from native dye bearing plants in Northeastern India. Bioresour. Technol.

[10] Ghouila, H., Meksi, N., Haddar, W., Mhenni, M.F. and Jannet, H.B. (2012). Extraction, identification and dyeing studies of Isosalipurposide, a natural chalcone dye from Acaciacyanophylla flowers on wool. Industrial Crops and Products, 35, 31–36.

[11] Gurav, M.V. and Pathade, G.R. (2010). Production of Vermicompost from Temple Waste (Nirmalya): A Case Study, Universal Journal of Environmental Research and Technology, 2, 182-192.

[12] Mehanta, D. and Tiwari, S.C. (2005). Natural dyeyielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh Northeast India. Curr. Sci., 88, 1474–1480.

[13] Mishra, P.K., Singh, P., Gupta, K.K., Tiwari, H. and Srivastava, P. (2012). Extraction of natural dye from Dahlia variabilis using ultrasound, Indian Journal of Fibre & Textile Research, 37, 83-86.

[14] Murthy, P.S. and Naidu, M.M. (2012). Sustainable management of coffee industry by-products and value addition-A review .Resources, Conservation and Recycling, 66, 45–58.

[15] Padmavathiamma, P.K., Li, L.Y. and Kumari, U.R. (2008). An experimental study of vermin biowaste composting for agricultural soil improvement. Bioresour. Technol., 99, 1672–1681.

[16] Phillips, J. and Mondal, M.K. (2014). Determining the sustainability of options for municipal solid waste disposal in Varanasi, India. Sustainable Cities and Society, 10, 11–21.

[17] Sajab, M.S., Chia C.H., Zakaria, S., Jani, S.M., Ayob, M.K., Chee, K.L., Khiew, P.S. and Chiu, W.S. (2011). Citric acid modified kenaf core fibres for removal of methylene blue from aqueous solution. Bioresour Technol., 102, 7237-7243.

[18] Shekdar, A.V. (2009). Sustainable solid waste management: An integrated approach for Asian countries. Waste Management, 29, 1438–1448.

[19] Venkatasubramanian, S., Vijaeeswarri, J. and Anna, J.L. (2011). Effective natural dye extraction from different plant materials using ultrasound, Industrial Crops and Products, 33, 116–122.

[20] Shivangi, S.C. Review Paper on-Ecofriendly Practice in Temple to Make Sustainable Approach toward Social and Environment. *Int. J. Res. Sci.* **2021**, *6*, 2024–2454.

[21] Singh, P.; Borthakur, A.; Singh, R.; Awasthi, S.; Pal, D.B.; Srivastava, P.; Mishra, P.K. Utilization of temple floral waste for extraction of valuable products: A close loop approach towards environmental sustainability and waste management. *Pollution* **2017**

[22] Ashritha, D.; Rawat, V.; Lakshmi, V.; Devi, R.H.; Kumar, R.; Sah, S. Post harvesting and value addition in marigold. *Pharma Innov. J.* **2022**.

[23] Saeed, S.T.; Samad, A. Emerging threats of begomoviruses to the cultivation of medicinal and aromatic crops and their management strategies. *VirusDisease* **2017**.

[24] Casella, P.; Marino, T.; Iovine, A.; Larocca, V.; Balducchi, R.; Musmarra, D.; Molino, A. Optimization of lutein extraction from scenedesmus almeriensis using pressurized liquid extraction. *Chem. Eng. Trans.* **2021**.

[25] Siriamornpun, S.; Kaisoon, O.; Meeso, N. Changes in colour, antioxidant activities and carotenoids (lycopene, β-carotene, lutein) of marigold flower (*Tagetes erecta* L.) resulting from different drying processes. *J. Funct. Foods.*

[26] Boonnoun, P.; Tunyasitikun, P.; Clowutimon, W.; Shotipruk, A. Production of free lutein by simultaneous extraction and de-esterification of marigold flowers in liquefied dimethyl ether (DME)–KOH–EtOH mixture. *Food Bioprod. Process.*