



Tech Meets the Taste: Unveiling the Future with 3D Food Printers

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Ever since man came into existence on the earth, he started to consume foods for his survival. As consumers' preference for taste and flavour gets changed over years, food has taken its manifestations in the processing sector. Food preparation consumes almost half of the time available in a day. In this context, ground-breaking technology called **3D food printing** is supposed to reduce the drudgery of homemakers in the process of food preparation. This technology enables bulk preparation of customized foods for ceremonies within short span of time. Luscious dishes with enhanced taste, flavour, texture and aroma could be 3 D printed without compromising its dietary nutritional values. This futuristic technology offers a sustainable alternative for conventional meat by producing lab grown meat with use of minimal resources supplemented with a higher protein value than that of the regular flesh. On one hand, around 68.7 million tonnes of food being wasted annually by Indian households, on the other hand, over 20 crore Indian sleep empty-stomach every day and it's even heart-breaking to know that more than 7000 Indians die per day due to hunger. In this way, 3 D food printers offers a unique solution by enabling start-ups to utilise left-over food wastes from restaurants and refurbishing them into brand new foods, thereby feeding the poverty stricken people in every nook and corner of the country.

Key words: 3 D food printing; customization; lab grown meat; food safety; novel foods

Introduction

In the era of innovation, this four letter word called "Food" has been revolutionizing the processing sector. Of course, who else is not fond of food? Beyond as a means for survival, food is looked for its taste, flavour, aroma and even for its eye catchy intricate designs appealing to the consumers. When we require a photocopy of a document, we used to insert the preferred file into a printer & it gives a beautiful document printed out of ink. How about printing your favourite food in your home? Yes, it's absolutely possible! Food processing sector has come up with a fascinating technology called "3 D Food Printing" which is bound to create limitless benefits that are beyond our imagination.

Customize your own meal

3 D Food printing is referred by a fancy term known as "additive manufacturing". The reason, why it is called additive manufacturing is that the addition of two enzymes named transglutaminase and hydrocolloids into the ingredients which retains the printed shape after cooking. This new generation machine creates a real time food accurately to form a customized shape of our wish, by depositing thin layer of ingredients one over the other.



Growth of 3 D food printing industry

3 D food printers are of no newer invention. It had been evolved back in 1980's but the only thing is that, scientists have started researching with this pioneer technology in the recent times. There comes a burgeoning growth in 3 D food printing industry and is expected to rise at a rapid annual growth rate of 48.1% from 2023 to 2030. 3 D food printing industry is globally valued at around \$201.5 million in 2022 and is expected to attain \$1.7 billion by the year 2030.

From Printer to Plate

3 D food printer has an inbuilt software technology in which it records history of your favourite tastes, preferences and flavour of food profiles cooked in the past. This technology serves as a best companion for diet freaks as it displays an individual's calorie level consumed. Accuracy and precision in 3 D food printer can be achieved by means of viscosity of food ingredients filled in the syringes, nozzle diameter from which the ingredients flow through, printing speed and distance and other post-processing methods like baking, frying and microwaving.

Relish Vegan Meat

This 3 D food printer acts as a blessing in disguise for vegans who wish to relish the taste of meat products by providing a plant based meat alternatives. This kind of lab grown meat has a peculiar feature of supplying high fibre content and lowered fat content differing from that of conventional meat. In addition to this aspect, this innovation furnishes equal quantity of protein as that of traditional meat, yet cholesterol free. Before coming into civilian use, this 3 D food printing technology was specifically designed for space astronauts to customize their nutritional needs, enhancing the shelf life of food, offering wider choice of varieties and ultimately ensuring freshness of food and food safety.



Commercial 3 D food printers

Some of the 3 D food printers commercially available at present include “Byflow focus, Mmuse, Foodini, Mycusini, Pancakebot, Procusini”.

Pros of 3 D food printers

- 3 D food printers enable customization and personalisation of food according to consumer choice and thus facilitates in printing of novel foods.
- This technology demands only minimal packaging, thus cutting down excess expenditure involved in packaging.
- Visually appealing complex and intricate designs can be achieved by means of this cutting edge technology.
- Excess pressure on agricultural lands can be mitigated by enabling use of alternative ingredients, such as plant based proteins, lab grown meats or algae.
- 3 D food printers cut down the demand for manpower involved in large mass of food preparation for ceremonies within a short period of time.
- 3 D food printers serve as a sustainable solution to meet out the food demand of current growing population.

Cons of 3 D food printers

- Taste of foods created from 3 D food printers differ from as that of conventionally prepared foods.

- Although 3 D food printers help to achieve precision in shape and texture, only limited range of ingredients can be fed to the cartridges.
- Though, 3 D food printers have innumerable benefits, they may not be affordable by all sections of the human society.
- Pre-processing works like filling of ingredients into the cartridges consumes considerable amount of time.
- Until now, most of the 3 D food printers require an external assistance to carry forward further processing like cooking in microwave oven or grill.
- Foods prepared by 3 D food printers are generally much fragile, making them to lose stability than the traditionally prepared foods.
- During the printing process, there may be a possibility of microbial accumulation which poses food safety concerns.
- 3 D food printers are applicable for only confined ranges of ingredients which can be extruded.

Recent advancements in additive manufacturing

- 3 D food printers have an inbuilt laser oven which often excites the consumers due to its juicy nature.
- Scientists are presently working with the disadvantages of solving the problem with the available 3 D food printers and trying to make them fully automated by eliminating the need for exterior microwave oven or grill.
- Ongoing researches to enhance the sensory attributes of 3 D printed foods to make them consumer appealing.
- Recent research on sustainable food practices are going on, in the field of entomophagy, in which insects are ground in the form of flour with the aid of 3 D food printers into edible foods that actually do not resemble insects. This modern technology not only solves the problem of food crises but also provide nutrient-dense foods that address the malnutrition concerns.

Conclusion

In the era of innovation, 3 D food printers serve as an ally to reduce the drudgery involved in creation of intricate food designs by chefs. As a famous proverb rightly goes, “The sky is not the limit”, researches are undergoing to inculcate multi-material printing system into 3 D food printers. No surprise that it can replace every cookware in our home kitchen in the future. But the real challenge lies in designing of user-friendly software for civilian use. Though 3 D food printers are accountable for their significant benefits in the modern era, the ultimate future expectation lies in “Whether it will be able to solve the global food hunger??”

References

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