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Nature's tiny powerhouse: Important roles of oilseeds

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Abstract
Oilseed crops are grown for the purpose of extraction of oil, which is contained in their seeds. Oil content of different oilseed crops varies from 20% for soybean to 40% of sunflower. Seed oils are used for industrial as well as edible purposes. Major world oilseed crops are soybean, sunflower, Brassica, canola, coconut, oil palm, rapeseed peanut, rice and cotton. Oilseeds and oilseed meals are included in diet fed to livestock to provide protein and energy. They are the second most important determinant of the agricultural economy, after the grain and the field crop segment.

Keywords: Oilseeds, bio-fuel, livestock, bio-ethanol and bio-diesel

Introduction
Oilseeds are a fascinating group of crops that play a pivotal role in agriculture, food production and countries industries. It plays a crucial role in agriculture, providing benefits to farmers, consumers and the global economy. They are primarily grown to produce edible oil, while the solvent extracted meals and press cakes of oilseeds are rich source of protein (Bernard, 2016) [14]. Soy is the main oilseed used for protein production, where soy proteins represent around 40% of soybean seeds and up to 70% of the pressed cake or the soybean. Recently emerging sources are increasingly gaining attention, such as canola and sunflower. These seeds are among the most important oily plants in the world (Kotecka *et al*., 2020) [15]. Oilseeds are nutrient dense and can be superior fragments of human diet. They mark significant source of vegetable oils. Oilseeds are a good source of various macronutrients and macronutrient (Yang *et al*., 2019) [16].

Advances in plant technology and the advent of metabolic engineering have enabled the modification of oilseed crops, thus establishing transgenic crop plant. Such transgenic plant oilseed crops have novel biosynthetic genes taken from noncommercial plants that provide the oilseed plant with good fatty acids (Thelen and Ohlorgge, 2002) [17]. To modify the fatty acid content of oilseed crops, the technique of mutagenesis is very important (Velasco and Fernandez-Martinez, 2000) [18]. In this way, these modified crops are responsible for the provision of great benefits to the human health.Various catabolic as well as biosynthetic enzymes have also been shown to play a significant role in the regulation of the fatty acid component of the oilseed crops. Among such biosynthetic and catabolic enzymes, the best characterized ones include KAS (β-ketoacyl-ACP synthases), TE (thioesterases), and acyltransferases (Dehesh, 2001) [38]. In soils that are tainted with a high cadmium content, that has accumulated due to the application of phosphatic fertilizers, specifically in Australia, the linseed crops accumulated much greater concentrations of cadmium compared to other crop species, such as wheat, canola, lupins, and Indian mustard (Hocking & McLaughlin, 2000) [20].

The biofuel industry
Faced with ecological contamination and economic constraints, at this moment it is now necessary to replace the currently used petrochemicals with renewable assets. Such renewable resources are straightforwardly accessible worldwide in the form of agronomic biomass over the above agricultural waste. These can be used in the place of feedstock in the assembly of liquefied biofuel (Nigam and Singh, 2011) [21]. In the contemporary world where environmental toxic waste is responsible for severe atmospheric destruction due to the greenhouse gas emissions, biodiesel accompanied by other volatile and non-volatile hydrocarbon (Drenth 2014) [22]. Fossil fuels, in their relentless use, are running down and their supplies are limited in the forthcoming years, consequently, biofuel is only solution. In point

of fact, the fuels fashioned from biomass are biofuel spawned in any of the solid, liquescent or gaseous forms. Such biofuel consist of bio-hydrogen, bio-ethanol, and biodiesel over and above bio-methanol. Biodiesel is the most eco-friendly fuel, shaped via esterification reaction of animal fats addition to vegetable oils. It can further be straightforwardly produced from either non-edible or edible oils (Yusuf, 2011) [23].

The food industry

For the nourishment and health, oilseed crops play the foremost role in food industries due to the existence of enriched nutritional content in the oilseeds. An oilseed crop baptized Guizotiaa by ssinca, frequently labeled Niger, has known pronounced importance. At present it is being extensively investigated due to its enriched nutritional singularity and antioxidant properties (Ramadan, 2013) [24]. Oilseed crops rich in protein content are a food source for humans as well as animals. An oilseed crop genus called Jatropha has raised content of all indispensable amino acids with the exception of lysine. Along these lines it is endorsed for 2-5-year-old children. Unlike soybean and rapeseed, Jatropha spoil vintages are considerably higher and therefore this had unlocked ways for use in the food industries (Sosa-Segura *et al*., 2014) [25].

The pharmaceutical industry

After fuel as well as food, oilseeds crops correspondingly have a prominent role in the pharmaceutical industries. An oilseed crop called Niger has extreme medicinal worth due to the occurrence of antioxidants (Ramadan, 2011) [26].

Sustainability of the environments

Environmental sustainability can be achieved if using fuel produced from oilseed crops. This reduces the pollution in the environment and does not increase carbon emission. *Jatropha curcas* is and oilseed crop, which has been used for the production of biofuel. The fuel which is produced from this crop contributes to sustainability because it does not increase the price of food items as it is nonfood crop, also it does not produce pollution and hence does not increase in carbon emission number. This crop has been significantly used to provide fuel and ethanol (Mofijur, 2012) [27]. Biodiesel which is produced from oilseed crops is renewable as well as eco-friendly (Jain & Sharma, 2010) [28].

Economic and social impact

Oil bearing plants offer a range of opportunities for small holder farmers, particularly in sub-Sharan Africa. Manual processing near the farm gate as small scale enterprise, and home utilization of the co- products the edible oil is consumed in food for energy to counter protein energy malnutrition or under-nutrition, the protein rich cake is fed to cattle for increased milk production, to poultry, and to pigs. Consuming the whole oil bearing seed as a snack, or baking oilseed into a snack food such as biscuits. The sale of high grade farm surplus for export to the confectionary industries inn industrialized nations.

Health benefits of oilseeds

In the most of countries, the focus is on brassica crops, which includes canola, rape and mustard. The word rape as applied to oilseed crops is derived from the Latin word rapum that means turnip. Today turnip rapes and the similar, but, more common swede rapes are grown for their oil and widely recognized by their bright yellow flowers. The bright dandelion-yellow flowers of oilseed rape have been a familiar sight across farmland in spring season. Rapeseed oil is one of the highest yield oils, it has very black seeds, which are like poppy seeds, and they are 45% oil and the other 55% is high protein animal feed. The brassica oilseeds contain a high oil content which makes them a good candidate for producing feedstock oils for bio-diesel. For example, spring canola contains upwards of 42% oil as compared to an oil content of about 20% for soybean (Sarwar, 2004) [29]. Edible fats and oils are similar in molecular structure; however, fats are solid at room temperature, while, oils are liquid. Fats and oils are essential nutrients, comprising about 40% of the calories in the diet of the average person. Edible vegetable oils are used as salad or cooking oils, or may be solidified (by a process called hydrogenation) to make margarine and shortening. These products supplement or replace animal products (butter, lard), supplies of which are inadequate to meet the needs of an increasing world population. While there are many uses for industrial vegetable oils, but, total world production is only about 3% of that of edible oils. Industrial applications are based on the properties of particular fatty-acid components of these oils. For example, flaxseed oil, rich in the unsaturated fatty acid linolenic, is a drying oil and is used in protective coatings (paints, varnishes). Vegetable oils are used in putty, printing inks, erasers, coating or core oils, greases, plastics, etc. The residue remaining after the oil has been extracted from oilseeds, is an important source of nutrients for farm animals. Oilseed meals from soybean, peanut, rapeseed and flaxseed are rich in protein; when mixed with other ingredients, and they provide nutritionally balanced feeds (Sarwar 2011) [30].

Uses of major oilseed crops

The most important product produced by oilseed plants, for food as well as feedstock, is the oil (Harwood *et al*., 2013) [31]. Oilseed crops are characterized as one of the major sources of biodiesel manufacture. Biodiesel is an alternative fuel in the petroleum industry and this can be viewed both positively and negatively. Positively is the production of low price biofuels, on the one hand, but on the other, the disadvantage is the prevalence of fuel over food, as edible oilseed crops are used to produce biodiesel fuel. In the past few years, non-edible oilseed crops have been explored as producers of biofuel (Balat, 2011) [32]. Oilseed crops are a good alternative to vegetable oil. Through biotechnology and metabolic engineering, oilseed crops can be transformed in a way to deliver the advantageous properties of the oil content (Lu *et al*., 2011) [33].

The most important oilseed crops are linseed, sesame, safflower, etc. but there are also other certain minor oilseed crops, which have important implications. In the class of minor oilseed crops, Niger is of great significance. The crop contains major fatty acids, including oleic acid, palmitic acid, stearic acid, and linoleic acid. The fatty acid content of the oilseed crops is the reason for the long-term eminence of the crop plants (Yadav, 2012) [34]. The survival of *Jatropha Curcas*, an oilseed crop, in harmful climatic circumstances, further heightens the standing of oilseed crops. This crop plant is an important source of feedstock and biofuel. The decline in the noxiousness of the crop through metabolic engineering can permit it to become feed for animals (Francis, 2013) [35].

Conclusion

Oilseed crops are considered bio-energy crops. The future is really secure in terms of energy production by growing these crops. In future, it is expected that the diesel and energy which is produced from fossil fuels and electricity will be

replaced by bio-energy produced by oilseed crops. One common example is the research going on to use corn seeds in the production of biofuel and bio-ethanol. Corn-based bio-ethanol production is expected to increase more than two-thirds in ten years. Corn-based bio-ethanol will reduce the consumption of common fuels (Elobeid, 2007) [36]. These oilseed crops have a bright future in biodiesel energy. Production of biodiesel can be increased in an environmentally sustainable fashion by producing it from soybean. This crop will provide immense benefits for the production of biodiesel as large amounts of diesel can be prepared with just a low concentration of crop. Moreover the left-over part of this crop can be used as feedstock for animals. With the advent of new technology and biotechnological tools such as new breeding methods for crops, these crops are expected to be grown largely in future to meet the increasing energy demands. Presently most of these crops are used as pharmaceutical materials and cooking oils but with the introduction of high technology methods, in the near future, these crops will be leading the bio-fuel industry of the world. Sunflower and rapeseed are some of the many examples of crops which can be used in the production of biodiesel and bio-ethanol by growing them efficiently (Li *et al*., 2010) [37]. Until now a total of 64 crops have been identified, only in China, which have the potential to be used to produce bio-fuel; of these, 38 are oilseed crops. Manipulation of these crops is necessary to use them as a potent agent for the production of bio-ethanol in future (Li, 2010) [37].

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