**APPLICANT NAME AND SURNAME**

**RESEARCH AREA :**

**ROJECT DURATION:**

**PROJECT TITLE:**Microorganism’s interactions with plants/animals to obtain biomolecules of relevant biotechnological applications

**ABSTRACT**

Studies focusing around the intecatins between plants and animals cannot be studied in partiality without turnindn and focus into microorganisams.Microoganisms play a crtical peart im the deeomeny amnd survival of both species in the ecosyetms.In fact the whole food chian can mare survie wih=thout the influence of both organism. This ysysmbiotic relationship has made reserac scients gain a keen intester int the benefiacila moutomces tht could come as a result of such an interaction.Stufies have been done and more studies are dstill onogoing into the study of smome of these microrgainsms habitual locations. Even though soo small to be seen by the naked eye, most microrganisms stay in the water, soil an air where they are more likely to intercat with their hosts. With the ongoing studies and research around biotechnology, scientist are shifting more focus into harnessing the power of these microorganisms to sustain more plant and animal survival species with the aim of improving the benefeiavk advamateges derived from plant and animal life.Wheraeas the world is also setting its ageda on combating food insecurity, onceof the ways toachive this is by critically analysing the the crucial role that these microbes play in the food ecosyetms, by the end of the day ,all reaecrh shuld help organisatioms, governments and sceintis harness the full power of micrpogramisns during their intercatins within their envirnnments. From intraspecific to interspecifc iteractions beteween plants and animals, some of these mirobes have a gone a top notch higher to gain and colinize their territories in the misdt sof their plany and animal ecological intercations having the full potential to colonize both the external and internal parts of plant and animal life, resulting in new coeveulotions among species and new plant and inimal kingdoms.Furthe reaerch also indicate that these intarcation sbetween plnats and animals exist in diffrebt categories that may include: intercatinons between microrgamis and pants and then microsograms and the animal life. Inline of this, this paper tries to examine the Biomediacl and biotechnological reaserch inputs established from tehse intreractions in a bid to solve some of the problems enciyntred in the economical production of food and insdtruial bio medical productions.Even thoigh econmiseshave not yet put enough programs and resources to help growing econmies achive substanctial reaserch and benefits from this relationship, a lot have has been done and cuurently most agri-food markets are currently implementating this. For instance as we shall also see later, that great hunger nand food related solutions cuould actually be solved by harneiign the dfll powrr of microbial and plant related interactions.

**Background study and problem statement**

Within the biotic environment, is is notabole to mention that order has been restored by the microoraginsms that inhabit these regions.Across the biotics environments that invluce water, soil and air, diifrent planta and animal life exists. Water regions like swamps, lakes, ponds, seas, oceans, reivers and seas are home to quite a number of plnat and animal life.Wheareas some of these waters are salty, others are fresh and still habor some of the thriving organisams found in these areas. The ability of these plants and animals to thrive in these regions is attributed to theit capacity to adapative natures. Most plants living in hyfrphytic environments have ceratin elaborate fetaures from within to help achieve this capability. For instance, they posses large leaves that have large stomata to help them release excessive amount of water stored in their xylem and phloems, their leaf surfaces are also large in nature and are dull in color to help them absorb more sunlight so as to relase the excesive water that they have stored, consequently, they posses llosely hanging roots that do not reach the water bed. Tropical plants have exploited thir capability on land to enable them best surrvie in givne climatic ciondfituond regardless of the wather or the ph levels of the soil from which they survive.Given their abikitie to store food on their leaves, stem, roots and seeds. As a result, the four most important biomoluecules can be extracted from these plants such as lipids,carbohydrates, nucleaic acids and proteins. In aquatic life and enviromnts, fish are able to survive given their varous abilities under thise condtions like their ctended bladder, that enable them to float in water and the possession of fins that give them the abikity to moave aroun din waterc regalrdless of the detection fo the water diretions. Its is also waorth noting that different water klevels and sources have different cmpositiosnd like salinity levels, temperature and chemical compositions desoite thee animals bing able to survive in such ecosystems. The human cell and body needs quite a number of nutrinets like proteins, calcium, cahbhydrates and lipds to survive. Human intercatyions with these microrhranisms help to achive these proceses. Most plants contain a lot of carbohydrate and as conten t needed by by animals and human being. The carbohydrate content in animals ai stored as starch wichi is a complex monosaccharide.The carabohydate componte produced by plants is later broken down into simplest form of monoscahcardie sugars needed by humans. As this study continues, much atanetiin has note been drawn to the micro-nutrines comonet of the plants, hweber considering their macro – elements composition, legumimuous panrs conatin hhgh level nitregne that is bemefivial to humans in building the muscle. Animals on the hand contain hgher levels of fats and protiens, fish have higher butrioal contnst of proteins and oils.

**The relationship**

In an ecsousyrtm where survia for the fittest dom;nates the ecological environemnts, tehse organisms have adavanced their daatie and survival mechanisms to peacefully co-exist among each other.

**The carbon cycle:**

Carbon as an element stands as the center of energy. Carbon atoms are continuously stored and released to the envoronement. How this happens is through a srieries of intercations between the existing organisms and their counterparts in the system. For instance, since most plants contain starh in their systems, when such plants cease to exist, they decompose and rote but since energy can never be detsred or chngedm, it can only be tranfomed from one form to another, the starch levels in their system is broken down into lower level and simple startch called monosahharides that are then broken down to carbon which is thenconsumed in the suystems of the next consumer. In some cases, if the carbnon is not consumed by the organisms, then it is absorbed in geographical rocks and oceanic bodies. Given their ability to habor carbon, oceanic water and certain tropical rocks habor and rlease this eaergy later on to the atmosphere. While in the air, the carnob is consumed again by the plants in form of carbindyoxide which then patciplctoate sin the photosynthesis prpcess and the resultant plnant food is stored as sucsrise in its simplest form but startch in its complex form. Animals on the other hand rely on this startch that is stored by plants as food. Now that carbon has been stored as energy by plants, animals consume it in and digest the starch component to get the carbihyfrate compmnte from it,and the cycle contuinues.

**The nitrogen cycle.**

It is basesless to discuss the symbiotic relationship of lants and animals b=without discussing the nitorgnet cycle. The thery behind the nitrogen cycle us that nitrogen is comstinulsy released into the environment in different forms.Naturaly, naitrgone occurs as a component of proteins and certain egumionus plants and animals have it in their systems. When luginous plants and animals die and get buried in the soil, they decompose and and their nutirnts are paased on from their bodies and are absorbed into the soil. In large water bosdies and oceans, the nitrogen coponet is stored among certain rocks and ocean beds, during cretian ocean activities and and proceces, the anitorgen is relased onto the atmosphere where its conveted inti gas.Altenatenaticvely, sich devcmposed plant are also used as manuare in criop production; which then consumes the nittogen as a nutrient and stores it. Legumonius plants containing the nitrogen are consumed by humans who then obtain the nitroben from the animsals and the cycle continues.

**The role of microorganism in plant and animal sysmbotic relationships**

Microgramiss are simple micropsc organism that can not be observed with the naked eye. Most are either rsingle celled or ranfe to a few number of cells. They include fungi, bacteria,protozoa, algaea and viruses. Even thggh most of these mivrograminsm have been known from their negative side as causing intoxications, deaseas and infections, let us not forget that they are also of benefiavl purposes to the human bodies and yteh animals that consume them.

Therre are two types of bacteria, aerobi and anaerobic bactreia, the arobic barectria species can survie in most soil conitions and under the influence of suffceint supply of oxygen, improve the soil fertility.the aerobacter bacteria *Aerobacter* and the actinomycetes bacteria give the soil ist earthly smell.Decomposing bacteria play a key role in heloing yo decompose dedead decaying organisms, dsuring the decsompseing procesm, the bascterai conume most of the simple sugards and nitrgent comnts from the decaying organisms andattcah it to their cell memberanes. In as much as the decompisnig becatreia dominate most of the agricvlutrally tilled lands, they are still ot efficeibt at carbon carrier-cinversion.

Then thera these three types of bacteria that convert the readily aviavle N2 from the air to a consumable nitrogen elemnt by plants, thee bacteria survive freely and do not hoist themselbevs on plants to do this, thse bcatria include the Azotobacter, Azospirillum and Clostridium.   The Rhizobium bacreia receive carbo from the plants and then take free exisyong Nitrogen from the air and with help of ixygen convert form nirte and nitattes whiceg are stored as food servers in the legumimnous plnats to form nodules. Under the presemce of Hyddrogen, nitate retacts with hydrogen to form ammonia which isaletr broken down by plantv cells to form amino acids which is a nutrional elment in leguminous plants. The *nitrogenase* fixing gbactreia has the ability to fix freely existing nitrogen into a form that plants can directly use.Bacterial balights are another catregory of bactrei tha cause dieseases in plnat sna andimas, nonetheless there are other healthy bacteria that are harmless to the pnats, te competition between the bligt bacteria and thehealthy bacteria strike a balance in the soil ecology and hence a heakthy thriving of the plants.

Prorozoa play a vital role in the reguslation of oather beacteria in the ecosystem. For instamce excess of the blight bacteria are fed aupon by the existing protzoazoa that in turn help to regulate the soil blanace by the organisms. Also, protozoa relaeae excess intrgen into the soil that is in turn consumed by the pants and animals. Fungi found in the soils help I the decomposition process by decomposing the hard to deompse materials in the soil thorugh a special type of fungi called “hyphae”, the nutrients released by these fungi are released into the soil and atomsohere for later consumption. Also, soils that have better fungi perfroamv=ce experience more compatncness and water infiltration facuilitation the fertility ptocess.

Alage as microrgramisms in the soil play a role in acting as agreen fertilizer, in their natural decompostions, they relaease nitrogennt and phosphorus which is later consumed by the other plants in the ecology.

**Biotechnology and the human body**

Having discuseed the relatonshop between microrganisms , the symbitics relationships revolving around them and the role that each play in the ecosystem, applicatons of biotechnology applucations can now be applied on this data.

Bacteriolgy is a filed of biotechngy that is concrene with biologiacll y engineering bacteria to achive certain levels of pridcton effcicieenes at indurtys scale.During this process, the biochemisrtry, morohholgy, ecology and genetics of the bacteria is studied. As such, the scpefic identification, characterisarion and classicafication af the different levels of bactria are established. Bactreiology has been pplied to help provide solutions in the fileds of medicine, agricutlture, food industry.

**Applications of biotechnology and bacteriology**

There is s a strain of bacteria called the *Lactobacillus, Lactococcus and Streptococcus,* these types of *bacteria*  have bben used in milk and mass production of dairy products such as cheese, yoighurt and butter.

Within the pharamaceutical industry, biotechnology and bactreilogy have been applied to produce certain vaaccines, some antibtios and healthy human enzymes. The invention and use of the conepts of bactreilogy in the fileld of phramacauticals have been used to provide some of the most outsatanding ummunizations and vaccies against deass like diphtheria, whooping cough, tenteanus and typhoid. Lots of humn lives have been saved as a result of this process.

Insulin as an enzyme and interferon and knionw tumor necrosis factor are protens that have been derved from the biotechnology of human hormones.These alongside other prodcts have been used toterat s=ecratin known decsoeases like dibates, AIDS a nd tuberculosis.

*Agrobacterium tumefaciens* is a bacterium that has been widely used in the in the plant and geneome restructrring. *A. tumefaciens* bacterium has predominatlu been used to produce plants that are resittant to harsh climatic conditions, diseases, herbiceds and industrial pescticides.

**Project aims and significance**

The raserevher aims to estblsih the following from theis study.

1. To establish the relationshop betwwen microorganisms and and plants
2. To establish the role that microgamnims play in plant and animal life
3. To establish how microgranims can be used to obtain biomolecules necessary for planta and animal survival
4. To determnine how biomelcelura elements can be used in undstrial biotechnology productions.

**The project hypotheses**

The reasrchver makes the below hypotheses based on the study:

1. Microorganisms exist in a symbiotic relationship
2. Microorganisms are the basic carriers and transfers of biomolecules in the ecosystem
3. Bitecehnolgy sollebt depends on microgogmisms in orderc to develop better and more products

**The literature review:**

Research studies done by Sylvia et al (2005) indicate that soil microbiology runs on principles that keppe the soil at equilibrium at any given point optimal, and that this is achieved with the knowledge and facts that withithin the soils there are harmfuls as well as healthy bacteria. Furhe, his reaserch indicates that soil miscrobes play a vital role in decompisng dead organic matter, improving soil water infiltattratin and abrosbsiption of certain useful biomolecules like nitrohen and carbon. Accorfing to Alown et al (2017), the the Phylogenetics as a branch of bacteriology is a study that has been used for a long time in identifying and marking the diffent stratins of bacteria, this is achived by using the 16 s Ribosamla DNS sequencing.Further, biodiversity has aplayed a key role in the identificatication and checkning the geographical distrubtion of certain bacteria species.

REFERENCES

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Alown, F., Alsharidah, A., & Shamsah, S. (2021). Genotypic characterization of soil bacteria in the Umm Al-Namil Island, Kuwait. *Saudi Journal of Biological Sciences*.

**Experimental plans**

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