IMPACT OF CLIMATE CHANGE ON CHOCOLATES AND A FUTURE WITH RUBY CHOCOLATES

Authors:

Rohan Pandey (Final Year Student at IIHM, Delhi)

&

Harsh Preet Singh Neerav (Group Corporate Chef, IIHM Hotel Schools)

Abstract

Purpose : This paper aims to discuss the changes that the industry of chocolate which will come about due to the changes in climate of the world as we know that chocolate grows best in the regions where it would easily melt in your hands , and with the rise and change in temperature. the areas which used to previously grow the said cocoa bean will become unfavourable , and to check the auntenticity of such attention grabbing headlines like " WILL CHOCOLATE BECOME EXTINCT IN THE NEXT DECADE" and etc further this paper also discusses the new item in callebaut's repetoior ruby chocolate or RB1,.

Design / Methodology / Approach: This paper goes to many sources in order to gain the information required in the process such as reputed news sites , academic journals and magazines as to find out the mysterious methods that Callebaut chocolate company is closely protecting , it also discuss the press releases that the company made in order to increase hype for the new product , further it also discussed the change in temperature and its implication sits the world with 4 chocolates fundamentally different chocolates

Findings : The paper proposes two different possible explanations for the this new kind of chocolate and the which range from a marketing gimmick and which would be supported from the claims of the company marketing it as the millennial chocolate as that is their target market , the other is done with modifications to the very process of making chocolate and their implications , it also ties in the process and shows how tempetrature and global warming plays a more than negligible role in these said processes it also displays the process pf maki g of chocolate and how it may be modified in order to produce this new sweet confection which the company heralds as a 4^{th} kind of chocolate

Originality / Value : This paper amasses great value as it provides not only a complete over view of the chocolate producing and manufacturing products and their implications , it also discusses and shows how it may grow and change with time and temperature and the introduction of this new kind of chocolate which is making waves .

Keywords - ruby , chocolate , temperature , chocolate , Callebaut , ruby chocolate .

INTRODUCTION

Ruby chocolate(Young, (5 September 2017)) is an assortment of chocolate presented in 2017 by Barry Callebaut, a Belgian-Swiss cocoa organization. The assortment has been being developed since 2004.(Ellis-Petersen, (6 September 2017)) It was disclosed at a private occasion in Shanghai on 5 September 2017(Gordon, (6 September 2017))(Terenzi, (9 September 2017)).The chocolate is produced using the "ruby cocoa bean".(Terenzi, (9 September 2017))(Gilchrist, (6 September 2017)) "Ruby beans" are existing herbal cocoa bean assortments that have been distinguished as having the correct ascribes to be prepared into ruby chocolate.(Nieburg, (14 September 2017)) .The chocolate's taste is portrayed as "sweet yet sour",(Corinne Gretler, (6 September 2017)) with "little to none" of the cocoa season customarily connected with different assortments of chocolate.(Churchill, (20 October 2017)).With the creation strategies being kept a competitive advantage and the utilization of hereditary alteration denied by Barry Callebaut, productions note industry hypothesis that ruby chocolate is made with unfermented cocoa beans, which can have a characteristic red-pinkish colour.(Churchill, (20 October 2017))(Nieburg, (14 September 2017))(Jay, (13 September 2017))[9] The organization likewise enrolled a patent in 2009 for "cocoa-inferred material" from unfermented cocoa beans (or beans matured for close to three days) that end up red or purple subsequent to treating them with a corrosive and after that defatting with oil ether.(AG, 2012-06-13)(Nieburg, (14 September 2017)).The assortment was not accessible available to be purchased to shoppers until 19 January 2018, when it was presented in another kind of Kit Kat bar, in Japan and South Korea, and additionally online.(Times, 2019) One stick was to cost 400 yen (USD$3.60).(Iyengar, (18 January 2018)) In April 2018, Kit Kat reported the arrival of the ruby chocolate in the UK yet Fortnum and Mason beat them to it, propelling the main ever ruby chocolate in Europe on 13 April 2018. Unit Kat propelled on the accompanying Monday.(News, 11 April 2018.)

While on the surface level it may appear that this has no relation with the changing climate and the induction of ruby chocolate is just another marketing gimmick imployed by a big corporation in order to reach their target market (which in this case is millennials), or is it a more sustainable way of producing and consuming a worldwide famous and loved treat , there have been many studies on climate change and the effects of it on the equatorial region some of which are (Change, 2018) ,and some sources even say that it might become a expensive or even worse extinct treat over the course of the coming century or even sooner , chocolate as a snack or baking ingredient has been timeless and now with the new and exciting changes that ruby brings now is the best time to be in the field of chocolate .

PROCESS AND PROCUREMENT

GROWING THE COCOA

Cocoa is generally developed on little family claimed plots of land, in spite of the fact that there are a few estates being built up in Asia. In Ghana the primary types of cocoa developed is called Forastero, and manors represent just 1% of cocoa generation there. (Loisel C., (1998))

Cocoa trees develop to between 12 to 15 meters high, and it is around 3-4 years before the blooms initially show up. The modest blooms are intricate to the point that bugs experience issues finding their way inside to prepare the dust.(Aguilera J.M., (2004)) Since this indispensable adventure to achieve the blooms' stamen is so troublesome, out of the 10,000 blooms created by each tree, just around 20 - 30 are pollinated and progress toward becoming cocoa cases. Each case contains around 40 seeds which progress toward becoming cocoa beans. (divinechocolate, 2019)

Most types of cocoa tree deliver two yields for each year. The cocoa units mature and are prepared for reaping around 5 to a half year after fertilization. In Ghana, the principle reap (70% of the year's yield) is among October and January, with a littler, optional product prepared in June. The monster cases, which resemble yellow rugby balls, develop straight out of the storage compartment and parts of the tree. (Ali A., (2001))

HARVESTING, FERMENTING AND DRYING THE BEANS

The gather time is urgent if great quality beans are to be delivered. On the off chance that the cases are too ready they are powerless against ailment, or the beans may begin to develop. In any case, if the cases are too green the cocoa beans will be of exceptionally low quality, on the grounds that insufficient of the 'aromatics' which create the recognizable (S.T., (1994).)Cocoa enhance are produced. Harvesting is extremely work concentrated;

The ranchers cut the cases from the trees which must be done cautiously so as to abstain from harming whatever remains of the tree. The units are then part open with enormous sharp bladed blades and the disgusting mash containing the beans is scratched out. Again this should be done correctly all together not to harm the beans. There have been endeavours to create machines to attempt this work, yet motorized cutting frameworks regularly harm the cocoa beans as are not generally utilized. (P.C., (1993).)

Once collected, the beans experience a two-arrange procedure to set them available to be purchased: aging and drying. These procedures start the change from severe cocoa bean to what in the long run winds up as the taste us as a whole love in chocolate bars. Maturation is a fundamental advance in building up the cocoa bean's 'aromatics'. They are piled up on dull green plantain leaves and afterward the leaves are folded over them. These "packages" are left in the warmth for 5-8 days to mature. (R.W., (1998))The beefy mash which holds the beans inside the unit is essential to the advancement of the cocoa season - this mash holds the new cocoa beans on banana leaf sugars, acids and yeasts which kick-begin the aging process. As maturation

advances, the temperature inside the load increments. This expels the growing force from the beans, the mash at that point swings to fluid and depletes away and the natural mixes in the bean begin to change to the shading and flavour that we connect with chocolate.

At long last the beans are dried. They are spread out on extensive tables in the sun and swung consistently to guarantee they dry uniformly and don't stick together. The drying procedure takes around 5-12 days and in this time the dampness content is diminished from 60% to fewer than 8%. The beans are then gathered into jute sacks and put away in completely ventilated stockrooms

MANUFACTURING

The beans are arranged and cleaned and afterward cooked at between 120ºC - 149ºC. The broiling builds up the shading and is the second stage in the improvement of the chocolate enhance that started amid aging on the cocoa farm. After simmering the beans are pounded to discharge the interior "nib" from the shells. They are then blown through an air burrow. This winnowing procedure blows the shell pieces into the bright blue sky from the cocoa nibs. The nibs are then ground into a thick darker fluid called cocoa mass. This is comprised of rich cocoa spread (55-60%) with fine cocoa particles suspended in it. The cocoa mass is then intensely squeezed until the point that the cocoa margarine is pressed out, and it is isolated into cocoa powder and cocoa spread. The cocoa powder would then be able to be utilized in chocolate beverages, confectionary and cooking. (FAO, (1992))

Cocoa spread and cocoa mass is consolidated in differing extents and the sugar and drain for drain chocolate is included. This blend is then mixed persistently more than a few days in a procedure called 'TEMPERING' which gives the completed chocolate its smooth, plush surface. It is then cooled gradually, while it is as yet moving in the machine. This is called hardening. The subsequent blend is considered covertures

And structures the premise of most completed chocolate items. It would then be able to be formed into chocolate bars, poured over individual confectionary things, melded into eggs and utilized in dessert. White chocolate has no cocoa powder, just cocoa margarine and sugar.(J.M., (2004).)

OBSERVATIONS

With the above given process we can gather that there are a few ways where they have made industrialized process that change the attributes of the chocolate itself, According to a press release , by the (Callebaut chocolate company,2017) , there are certain process that will change the well known confection , and change the flavour profile , some say that during the second fermentation that the cocoa bean undergoes it picks up a reddish , purple hue and some postulate the red hue that is found in the ruby chocolate is harvesting it earlier in the cycle , and would mean that it would yield an unfavourable result . But due to the industrial processes used it would yield the well know ruby chocolate and would explain the patent (AG, 2012-06-13)

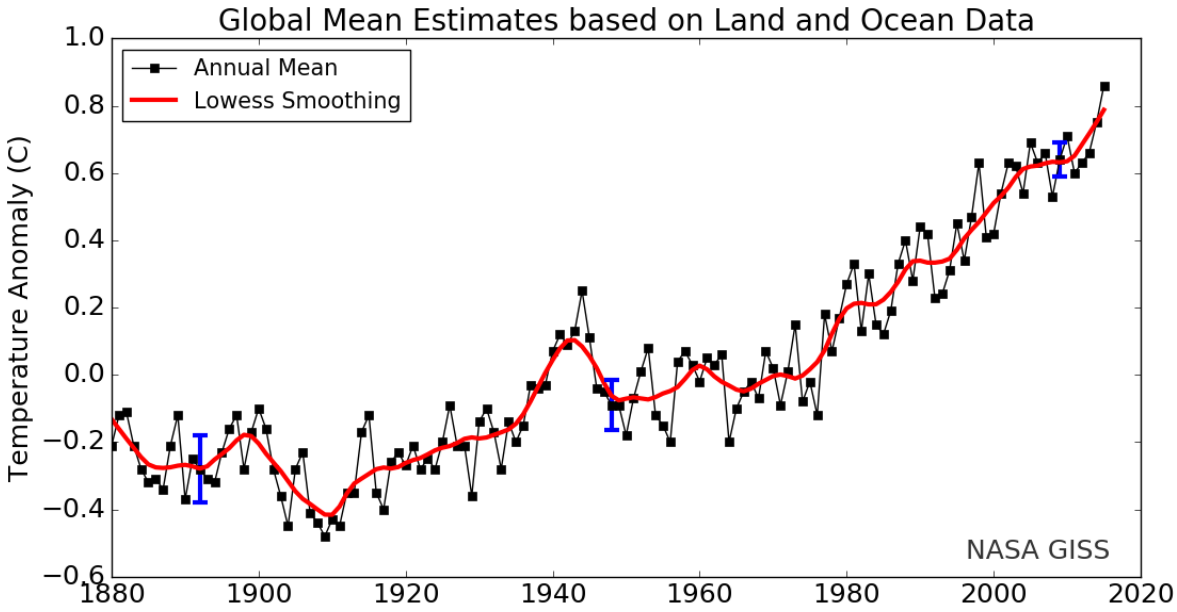
A second theory, states that there is about dominant and recessive genes, which are mentioned in the appendices where, wherein the ruby fruit is the product of a recessive gene, and a produces a fruit with a pinkish hue and thus the resulting butter to be dyed in the same hue as well as change the flavour of the finished product, some producers of this cocoa before (Callebaut chocolate company, 2017) such as (cacao, 2019)

CLIMATE CHANGE AND EFFECT ON CHOCOLATE

A great deal of the Internet-perusing open spent the start of their New Year looking past forecasts that chocolate could be wiped out continuously 2050, prompting a marginally distracted discourse about whether it could be saved by means of treats organization supported hereditary designing.

The chocolate doomsday news was to some degree exaggerated on the web; the wellspring of the current week's craziness was a two-year-old report from the National Oceanic and Atmospheric Administration. In any case, a point it brought was that up in a great deal of cases, environmental change is contracting the areas where our most loved sustenance's can develop. Which implies that rising temperatures will render certain sustenance's out of reach not on the grounds that they'll go terminated immediately, but rather in light of the fact that they're possibly going to wind up madly costly.

"Lamentably, cacao trees don't flourish in the calm atmosphere of the mainland United States," the NOAA (NOAA, 2018) detailed in 2016. "Chocolate develops best in the spots where it would rapidly dissolve in your grasp. Throughout the following quite a few years, those spots may develop hotter, drier, and less appropriate to cacao development." Said an article(MEDRANO, 1/3/18) and while this may be the case for a longer duration this will not be the case for the following years according to the report (Mohino, 20 January 2015) , there has been change in the equatorial regions of the world but not enough to cause any massive change in coming years , which might affect the immediate flora and fauna , and more specifically our beloved cocoa plants more supporting evidence is available in the appendices



Graph courtesy-(page, 2016) **and** (association, 2019)

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APPENDICIES

APPENDIX 1 –

What are Dominant and Recessive?

The terms dominant and recessive describe the inheritance patterns of certain traits. That is, they describe how likely it is for a certain phenotype to pass from parent offspring.

Sexually reproducing species, including people and other animals, have two copies of each gene. The two copies, called alleles, can be slightly different from each other. The differences can cause variations in the protein that's produced, or they can change protein expression: when, where, and how much protein is made. Proteins affect traits, so variations in protein activity or expression can produce different phenotypes.

A dominant allele produces a dominant phenotype in individuals who have one copy of the allele, which can come from just one parent. For a recessive allele to produce a recessive phenotype, the individual must have two copies, one from each parent. An individual with one dominant and one recessive allele for a gene will have the dominant phenotype. They are generally considered "carriers" of the recessive allele: the recessive allele is there, but the recessive phenotype is not.

The terms are confusing and often misleading

Dominant and recessive inheritance is useful concepts when it comes to predicting the probability of an individual inheriting certain phenotypes, especially genetic disorders. But the terms can be confusing when it comes to understanding how a gene specifies a trait. This confusion comes about in part because people observed dominant and recessive inheritance patterns before anyone knew anything about DNA and genes, or how genes code for proteins that specify traits.

The critical point to understand is that there is no universal mechanism by which dominant and recessive alleles act. Dominant alleles do not physically "dominate" or "repress" recessive alleles. Whether an allele is dominant or recessive depends on the particulars of the proteins they code for.

The terms can also be subjective, which adds to the confusion. The same allele can be considered dominant or recessive, depending on how you look at it. The sickle-cell allele, described below, is a great example.

Do a simple internet search, and you'll find pages and pages of charts, images, and text explaining dominant and recessive inheritance patterns. However, these patterns apply to few traits.

Inheritance patterns

Sickle-cell disease is an inherited condition that causes pain and damage to organs and muscles. Instead of having flattened, round red blood cells, people with the disease have stiff, sickle-shaped cells. The long, pointy blood cells get caught in capillaries, where they block blood flow. Muscle and organ cells don't get enough oxygen and nutrients, and they begin to die.

The disease has a recessive pattern of inheritance: only individuals with two copies of the sickle-cell allele have the disease. People with just one copy are healthy.

In addition to causing disease, the sickle-cell allele makes people who carry it resistant to malaria, a serious illness carried by mosquitoes. Malaria resistance has a dominant inheritance pattern: just one copy of the sickle cell allele is enough to protect against infection. This is the very same allele that, in a recessive inheritance pattern, causes sickle-cell disease!

Now let's look again at the shape of the blood cells. People with two copies of the sickle-cell allele have many suckled red blood cells. People with two copies of the "normal" allele have disc-shaped red blood cells. People with one sickle-cell allele and one normal allele have a small number of suckled cells, and their cells sickle more easily under certain conditions. So we could say that red blood cell shape has a co-dominant inheritance pattern. That is, individuals with one copy of each allele have an in-between phenotype.

So is the sickle cell allele dominant, recessive, or co-dominant? It depends on how you look at it.

Protein function

If we look at the proteins the two allele's code for, the picture becomes a little clearer. The affected protein is haemoglobin, the oxygen-carrying molecule that fills red blood cells. The sickle-cell allele codes for a slightly modified version of the haemoglobin protein. The modified haemoglobin protein still carries oxygen, but under low-oxygen conditions the proteins stick together.

When a person has two sickle cell alleles, all of their haemoglobin is the sticky form, and the proteins form very long, stiff fibres that distort red blood cells. When someone has one sickle-cell allele and one normal allele, only some of the haemoglobin is sticky. Non-sticky haemoglobin is made from the normal allele, and sticky haemoglobin is made from the sickle-cell allele (every cell has a copy of both alleles). The sticking-together effect is diluted, and in most cells, the proteins don't form fibres.

The protest that causes malaria grows and reproduces in red blood cells. Just exactly how the sickle-cell allele leads to malaria resistance is complex and not completely understood. However, it appears that the parasite reproduces more slowly in blood cells that have some modified haemoglobin. And infected cells, because they easily become misshapen, are more quickly removed from circulation and destroyed.

To see more examples of how variations in genes influence traits, visit The Outcome of Mutation.

Common Myths Explained

Dominant and recessive are important concepts, but they are so often over-emphasized. After all, most traits have complex, unpredictable inheritance patterns. However, at the risk of adding even more over-emphasis, here are some more things you may want to know:

Dominant phenotypes are not always more common than recessive phenotypes

Let's look at a typical (i.e., rare) single-gene trait:

- Dominant allele + dominant allele = dominant phenotype
- Dominant allele + recessive allele = dominant phenotype
- Recessive allele + recessive allele = recessive phenotype

Looking at this, you might conclude that the dominant phenotype is twice as common as the recessive one. But you would probably be wrong.

Recessive alleles can be present in a population at very high frequency. Consider eye colour. Eye colour is influenced mainly by two genes, with smaller contributions from several others. People with light eyes tend to carry recessive alleles of the major genes; people with dark eyes tend to carry dominant alleles. In Scandinavia, most people have light eyes—the recessive alleles of these genes are much more common here than the dominant ones.

Dominant alleles are not better than recessive alleles

Mode of inheritance has nothing to do with whether an allele benefits an individual or not. Take rock pocket mice, where fur colour is controlled mainly by a single gene. The gene codes for a protein that makes dark pigment. Some rock pocket mice have dark fur, and some have light fur. The dark-fur allele is dominant, and the light-fur allele is recessive.

When mice live in a habitat filled with dark rocks, dark fur is "better" because it makes the mice less visible to predators. But when mice live in a habitat filled with light rocks and sand, light fur is "better." It's the environment that matters, not whether the allele is dominant or recessive.

A "broken" allele can have a dominant inheritance pattern

Many genetic disorders involve "broken" genes that code for a protein that doesn't work properly. Since one "normal" copy of the gene can often provide enough of the protein to mask the effects of the disease allele, these disorders often have a recessive inheritance pattern. But not all diseases alleles are recessive. Keratin proteins link together to form strong fibres that strengthen hair, fingernails, skin, and other tissues throughout the body. There are several genetic disorders involving defects in keratin genes, and most of them have dominant inheritance patterns.

To see how defective keratin genes can lead to a genetic disorder, see Pachyonychia Congenita.

APPENDIX -2

Experts fear chocolate will run out in 30 years because cacao plants are dying in hot climates

CHOCOLATE could soon be a thing of the past with experts warning our favourite treat faces a serious threat of running out sooner than you think.

The Sun

News Corp Australia Network -JANUARY 2, 2018 9:23AM

CHOCOLATE could run out in the next thirty years because the crop will be harder to grow in a warming climate, experts have warned. The cacao tree — from which we get cocoa beans — thrives only in humid rainforest-like conditions close to the equator. But the fragile plant is under threat from diseases and a changing climate that will suck moisture from the soil and make it impossible to produce a good crop in many regions around the world by 2050, reports The Sun. Raw beans being extracted from the coco pods. Picture: Stewart McLeanSource:News Corp Australia

Currently two West African countries, Ivory Coast and Ghana, produce more than half the world's cocoa but this region is forecast to be hit by rising temperatures and droughts. Farmers will be forced to move crops to higher ground, but there is limited space and many upland areas are protected for wildlife. Already demand for chocolate outstrips supply as billions of Asians have found a love of the sweet treat like Europeans and North and South Americans. Stockpiles of cocoa are running low and the effects of climate change on yields could add up to a serious global shortage, according to one expert.

Doug Hawkins, of Hardman Agribusiness, said part of the problem is most cocoa is produced by poor families who cannot afford fertilisers and pesticides. The cacao tree can only thrive in humid rainforest-like conditions.Source: Supplied

He said: "More than 90 per cent of the global cocoa crop is produced by smallholders on subsistence farms with unimproved planting material. "All the indicators are that we could be looking at a chocolate deficit of 100,000 tons a year in the next few years."Modern farming techniques could improve yields but that is only part of the answer, experts say. Scientists funded by choc giant Mars have recently mapped the genetic code of cacao trees — almost all of which descend from the same few plants in the upper Amazon. Now they are working on creating new genetically modified hybrids that they hope could withstand hotter and dryer weather and still produce high quality cocoa.