***PHENOMENON OF INBREEDING DEPRESSION ON MAIZE***

**IN PERSPECTIVE OF THE AL-QURAN**

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**ABSTRACT**

Objectives of this study were to learn and prove the truth and scientific miracles of the al-Qur'an, specifically the prohibition of incest for humans, also applies and affects especially on the growth and yieldin particularly open pollinated plants such as maizethrough the process of inbreeding depression. The results of yield of each genotype of the tested inbred line showed yield reduction in all inbred lines tested fromgeneration of S1 to S5. Lamuru and Bisma which was generated with open pollinated breeding produced relatively stable yield from generation of S1 to S5. The entire tested inbred lines showed some trait changes, such as height of crop (cm) and yield of grains (t ha-1) that tended to decline and die, while Lamuru and Bisma tended to be stable. It is implied in letters of the al-Quran, which forbid inbreeding for human (QS al-Nisa’: 23) that is very detrimental, not only on life sustainability of human beings and animals, but also on plants, particularly on the cross-pollinated plants*.*The scientific truth of the al-Quran which prohibits incest for humans in QS al-Nisa ': 23 is proven to be identical and also applies in maize.

Keywords: Inbreeding depression, Maize, Agriculture, Biology, Al-Quran.

**INTRODUCTION**

The tenet of Islam revealed to the Prophet Muhammad were as a mercy to the worlds (QS al-Anbiya: 107), the blessing was to not only for humans, but also animals and plants, including Maize.Maize is a monoecious plant, which has separate*tassel* (male flower) and *silk* (female flower) in the same plant (Ray (1627-1705)cit Porter, 1959; Weatherwax, 1916; Rhoades,1931; Westergaard, M.,1958; Moreira, 2010). In general, maize has cross pollination, in which range of the pollen grains may reach 50 m (Jones & Newell, 1948; Bannert, 2007) and sometimes it may reach 100-371 m (Airy,1955; Bannert, Vogler, & Stamp, 2008).Maize is a staple food plant which is the most important carbohydrate producer that has benefits for lives of humans, animals and other creatures. Moreover, the benefits are not limited to the provision of food but also make the environment healthier where providing the air becomes fresh because corn plants produce oxygen needed by humans and other creatures for life, so that it becomes the good of the actor (farmer) until doomsday.It is in line with hadith of the Prophet: " The goal of muslim to cultivate of plants is to produces of food for humans, animals or birds as the alms for him until doomsday." (Narrated by Imam Muslim hadith no.1552 (10).

In addition, there is a common breed between humans and corn, male and female cells that are always paired. Even the al-Quran calls the pair (*zauj-azwaj*) at least 34 times used for humans, animals and animals. And specifically related to a pair of plants, is called at least 9 times, namely: QS Yasin: 36, QS al-Zuhruf: 12, QS al-Hajj: 5, QS al-Shu'ara ': 7, QS Luqman: 10 , QS Qaf: 7, QS al-Ra'd: 3, QS al-Dzariyat: 49, and QS Thaha: 53.

On the basis of pairing, humans have the nature to marry. In marriage, on the one hand it is commanded by the al-Qur'an (QS al-Nisa ': 3, QS al-Nisa': 25, QS al-Nur: 32), but on the other hand there is a prohibition on marrying blood relatives, with His Words “*Forbidden unto you are your mothers, and your daughters, and your sisters, and your father’s sisters, and your mother’s sisters, and your brother’s daughters, and your sister’s daughters, and your foster-mother, and your foster-sisters, and yourmothers-in-law, and your step-daughters who are under your protection (born) of your women unto whom you have gone in – but if you have not gone in unto them), then it is no sin for you (to marry their daughters) – and the wives of your sons who (spring) from your own loins. And (it is forbidden unto you) that you should have two sisters together, except what have already happened (of that nature) in the past; indeed, Allah is ever Forgiving. Merciful*” (QS al-Nisa’: 23). If the ban is violated, marriage of relatives has reproductive problems that cause congenital abnormalities in hereditary genetics (Paige, 2010). This phenomenon looks like in the process of inbreeding depression to produce hybrid plants, especially in maize which has superior properties, where in the process of inbreeding there is a decrease in the characteristics of being ugly even to death, but will return to show its superior characteristics when crossed again with different relatives which has long of genetic distance.

Many efforts that concerning with genetic improvement have been done to increase the yield through breeding techniques, and one of them is hybrid breeding, which was started by self-breeding for inbreeding depression.Self-breeding in maize is one of techniques on breeding process. Self-breeding will change its genetic constitution into homozygous. It is due to maize has cross pollination and heterozygous heterogeneous(Shull, 1908; Winn, *et al*. 2011; Kustanto, Basuki, Kasno & Sugiharto, 2012; Nagamits & Futamura, 2014). Inbred lines were formed from heterozygote individual through self-pollination and lead to segregation and vigor decline. However, vigor decline keeps occurring in each generation of self-pollination and forms homozygote inbred lines. In the first generation of self-pollination, the vigor declined for about a half of the total vigor decline, and became a half in the next generation. Characters of the plant, which had vigor decline due to self-pollination, will show various defects, such as: decreasing height of plant (shorter), tend to fall down, sensitive to diseases, the yield decrease, and various unexpected characters may emerge. Such phenomenon is so-called inbreeding depression (Poehlman, 1983; Kustanto, Basuki, Kasno & Sugiharto, 2012; Pekkala, Knott, Kotiaho, Nissinen, & Puurtinen, 2014).

# Self-pollination in the formation process of inbred lines on plant breeding is intended to regulate the expected traits in homozygote condition, so that the genotype will be maintained without any genetic change. In self-pollination process, more unexpected recessive genes become homozygote and show up their phenotypes. The origin plant is so-called S0, and the progeny from self-pollination of the plant is so-called S1 (progeny from self pollinationof the first generation). Progeny from self-pollination of the second generation is so-called S2, and so on (Poehlman, 1983, Cheng, Williams & Zhang, 2012; Kustanto, Basuki, Kasno& Sugiharto, 2012; Jaradat and Goldstein, 2018). The lost vigor during self-pollination period was regained on progeny F1when the inbred line was crossbred with other inbred lines, which had no correlation (Poehlman, 1983; Pekkala, Knott, Kotiaho, Nissinen, & Puurtinen, 2014).

Phenomenon such as inbreeding depression is actually implied in the verses of the Al-Quran, but some difficulties found to connect it, so the facts about the truth of science and scientific methods and the Al-Quran have gone separately. Therefore, this article is intended to connect it as well as to prove the truth of the Qur'an which prohibits inbreeding (QS al-Nisa ': 23) with the phenomenon of inbreeding depression in Maize using scientific methods.

**MATERIALS AND METHODS**

Materials of the research were 6 inbred lines of the 1st generation (S1) to the 5th generation (S5), such as: UWS-01, UWS-02, UWS-03, UWS-04, and UWS-05 at generations S1, S2, S3, S4, and S5, which derived from inbreeding depression of the commercial varieties in Indonesia, both hybrids and open pollinated varieties that belong to the Faculty of Agriculture, University of Wahid Hasyim, Semarang. As standard of comparison, 2 open pollinated varieties were used as follow: Bisma and Lamuru.The research was conducted by planting 6 genotypes of inbred line and 2 genotypes of check from each generation with RCBD 3 replications. Experiments and preparation of the experiment materials were conducted at Purwodadi, Grobokan, Central Java. The research was implemented from October 2011 – December 2016.

Experiments were done to study the genetic variability among inbred lines. Experiment in the field was performed by planting genotypes using Randomized Block Completed Design (RCBD) by 2 replications. Data of the observation results on the whole tested genotypes was analyzed using analysis of variance. The linear additive model of the RCBD is as follows: (i) Xijkl = µ + gijk + bl +ijkl, in which: (1) Xijkl= value of the observed traits at the-*ijk* genotype, the 1stgroup, (ii) µ = effect of median value of the population from the observed traits, (iii) gijk= effect of the-*ijk* genotype on the observed traits, (iv) bl= effect of the 1st group on the observed traits, (v) ∑ijkl= effect of the experimental error on the*-ijk* genotype and at the-*i* group.

F-test was conducted to study the effect of genotype, if the genotype has significant difference, the calculation will be followed by Least Significant Difference (LSD) test. LSD = tα/2 (2s2/r)½, in which: tα/2= t value at level-α, s2= error of Mean Squares (MSe), r = number of replication. In order to find out variability among genotypes, the equation of Genotypic coefficient of variation (GCV %) =$\frac{\sqrt{genetic variance}}{x̄}$ x 100%, in which:x̄ = average population, genetic variance = σ2g, σ2g = (MSg- MSe)/r, σ2g= σ2f - σ2e, in which: σ2f = phenotypic variance, σ2e = environmental variance/error, r= replication.GCV (%) criteria values are as follow: 0 – 25% (low); 25 – 50% (medium); 50 – 100% (high). Assumption of heritability with broad sense using component of variance by the equation: H2=( σ2g/σ2f ). Heritability classification is as follows: < 30% (low); 30 - 50% (medium); and> 50% (high).

**RESULTS AND DISCUSSION**

Results of the inbreeding depression by manipulating the crossbred showed the traits, which tend to be heredity as presented in Table 1.

Table 1.Average plant height (cm) of Inbred lines on generation S1-S5 in comparison with the check.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inbred lines | S1 | Inbred lines | S2 | Inbred lines | S3 | Inbred lines | S4 | Inbred lines | S5 |
| UW-01 | 198.33 a | UW-01 |  172.16 a | UW-01 | 173.33 a | UW-01 | 158.47 a | UW-01 | 152.70 a |
| Lamuru | 200.03 a | UW-02 | 193.83 a | UW-03 | 186.67 a | UW-03 | 175.50 ab | UW-03 | 165.17 a |
| Bisma | 205.01 a | UW-03 | 198.57 a | UW-02 | 186.83 a | UW-02 | 177.17 ab | UW-02 | 171.10 ab |
| UW-05 | 208.33 a | Lamuru | 200.11 a | Lamuru | 193.33 a | UW-05 | 190.17 b | UW-05 | 185.37 b |
| UW-02 | 212.01 a | Bisma | 203.33 a | UW-05 | 198.33 a | Bisma | 200.33 b | Bisma | 198.33 b |
| UW-03 | 215.17 a | UW-05 | 206.67 a | Bisma | 200.01 a | Lamuru | 200.17 b | Lamuru | 201.67 bc |
| UW-04 | 226.67 a | UW-04 | 216.67 a | UW-04 | 222.17 a | UW-04 | 218.67 b | UW-04 | 217.73 c |
| Average | 209.36 | Average | 198.72 | Average | 194.38 | Average | 188.57 | Average | 184.58 |
| Sign. | Ns | Sign. | Ns | Sign. | Ns | Sign. | \* | Sign. | \* |
| LSD (p<0.05) | - | LSD (p<0.05) | - | LSD (p<0.05) | - | LSD (p<0.05) | 30.89 | LSD (p<0.05) | 18.55 |
| CV (%) | 5.56 | CV (%) | 8.94 | CV (%) | 8.83 | CV (%) | 9.21 | CV (%) | 5.65 |
| GCV (%) | 5.83 | GCV (%) | 8.07 | GCV (%) | 10.22 | GCV (%) | 15.79 | GCV (%) | 20.77 |
| H2 | 52.35 | H2 | 44.86 | H2 | 57.23 | H2 | 74.62 | H2 | 93.11 |

Note: S1= 1st Generation, S2= 2nd Generation, S3= 3rd Generation, S4 = 4th Generation, S5= 5th Generation, Sign.=Significancy, LSD: Least Significant Difference, CV= Coefficient of variation, GCV= Genetic coefficient of variation. H2= Heritability.

Average values of the plant height for all genotypeson generation S1did not show any significant difference with the average value was 209.36 cm, the lowest value of UW-01 was 198.33 cm and the highest value of UW-04 was 226.67 cm.Average values of the plant height for all genotypes on generation S2 did not show any significant difference with the average value was 198.72 cm, the lowest value of UW-01 was 172.16 cm and the highest value of UW-04 was 216.67 cm. Average values of the plant height for all genotypes on generation S3 did not show any significant difference with the average value was 194.38 cm, the lowest value of UW-01 was 173.33 cm and the highest value of UW-04 was 222.17 cm. Average values of the plant height for all genotypes on generation S4 did not show any significant difference with the average value was 188.57 cm, the lowest value of UW-01 was 158.47 cm and did not show significant difference with UW-03 and UW-02, while the highest value of UW-04 was 218.67 cm. Average values of the plant height for all genotypes on generation S5 showed significant difference with the average value was 184.58 cm, the lowest value of UW-01 was 152.70 cm and did not show any significant difference with UW-03 and UW-02, while the highest value of UW-04 was 217.73 cm. Coefficient of variance (CV) on all generations of the experiments S1-S5 ranged between 5.56 – 9.21%. Coefficient of variance on genetic for all generations of experiments S1-S5 ranged between 5.83 – 20.77%. Heritability on all generations of experiments S1-S5 ranged between 44.86 – 93.11%. Average values of the grains yield are presented in Table 2.

Table 2.Average Yield of Grains (t ha-1) of Inbred lines from generation S1-S5 in comparison with the check.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inbred line | S1 | Inbred line | S2 | Inbred line | S3 | Inbred line | S4 | Inbred line | S5 |
| UW-05 | 5.40 a | UW-04 | 4.97 a | UW-03 | 4.40 a | UW-02 | 3.53 a | UW-01 | 1.93 a |
| UW-03 | 5.50 a | UW-03 | 5.00 a | UW-04 | 4.43 a | UW-03 | 3.80 ab | UW-03 | 3.13 b |
| UW-04 | 5.67 a | UW-01 | 5.27 a | UW-01 | 4.46 a | UW-04 | 3.87 ab | UW-05 | 3.17 b |
| UW-01 | 6.07 a | UW-05 | 5.73 ab | UW-05 | 4.90 ab | UW-01 | 4.07 b | UW-02 | 3.50 b |
| UW-02 | 7.73 b | UW-02 | 5.67 b | UW-02 | 5.40 b | UW-05 | 4.30 b | UW-04 | 3.50 b |
| Bisma | 8.53 bc | Bisma | 8.27 c | Bisma | 7.90 c | Lamuru | 8.20 c | Bisma | 7.67 c |
| Lamuru | 8.70 c | Lamuru | 8.57 c | Lamuru | 8.07 c | Bisma | 8.27 c | Lamuru | 8.03 c |
| Average | 6.80 | Average | 6.34 | Average | 5.68 | Average | 5.15 | Average | 4.42 |
| Sign. | \* | Sign. | \* | Sign. | \* | Sign. | \* | Sign. | \* |
| LSD (p<0.05) | 0.85 | LSD (p<0.05) | 0.9 | LSD (p<0.05) | 0.6 | LSD (p<0.05) | 0.51 | LSD (p<0.05) | 0.49 |
| CV (%) | 7.01 | CV (%) | 8.36 | CV (%) | 5.95 | CV (%) | 5.55 | CV (%) | 6.22 |
| GCV (%) | 36.77 | GCV (%) | 40.78 | GCV (%) | 48.69 | GCV (%) | 71.15 | GCV (%) | 94.05 |
| H2 | 96.49 | H2 | 95.96 | H2 | 98.52 | H2 | 99.39 | H2 | 99.56 |

Note: S1= 1st Generation, S2= 2nd Generation, S3= 3rd Generation, S4 = 4th Generation, S5= 5th Generation, Sign.=Significancy, LSD: Least Significant Difference, CV= Coefficient of variation, GCV= Genetic coefficient of variation. H2= Heritability.

Average values of the grains yield for all genotypes on generation S1 showed significant difference with the average value was 6.80 t ha-1, the lowest value of UW-05 was 5.40 t ha-1, anddid not show significant difference with UW-01, UW-04, and UW-03, while the highest value was Lamuru for about 8.70 t ha-1 and did not show significant difference with Bisma.Average values of the grains yield for all genotypes on generation S2showed significant difference with the average value was 6.34 t ha-1, the lowest value of UW-04 was 4.97 t ha-1, and did not show any significant difference with UW-03, UW-01, and UW-05, while the highest value was Lamurufor about 8.57t ha-1 and did not show any significant difference with Bisma.Average values of the grains yield for all genotypes on generation S3showed significant difference with the average value was 5.86 t ha-1, the lowest value of UW-03 was 4.40 t ha-1, and did not show significant difference with UW-05, UW-01, and UW-04, while the highest value was Lamuru for about 8.07 t ha-1 and did not show any significant difference with Bisma.

Average values of the grains yield for all genotypes on generation S4showed significant difference with average value was 5.15 t ha-1, the lowest value of UW-05 was 3.53 t ha-1, and did not show any significant difference with UW-03 and UW-04, while the highest value was Bisma for about 8.27 t ha-1 and did not show any significant difference with Lamuru. Average values of the grains yield for all genotypes on generation S5showed significant difference with average value was4.42 t ha-1,the lowest value was UW-05 for about 1.93 t ha-1, while the highest value was Lamuru for about 8.03t ha-1 and did not show any significant difference with Bisma. Coefficient of variance (CV) on all generations of experiments S1-S5 ranged between 5.55 – 8.86%. Coefficient of variance on genetic for all generations of experiments S1-S5 ranged between 36.77-94.05%. Heritability on all generations of experiments S1-S5ranged 95.96-99.56. Average yield of grains for each inbred line generation in comparison with Bisma and Lamuru on generations S1-S5 are presented in Chart 1.

Chart 1.Average yield of harvest in each inbred line generation in comparison with Bisma and Lamuru on generations S1-S5.

Average yield of each tested genotype of inbred line showed some reduction of yield, such as: (1) UW-001 produced 6.07 t ha-1in generation S1and reduced in generation S5became 1.93 t ha-1. (2) UW-002 produced 7.73 t ha-1in generation S1and reduced in generation S5became 3.50 t ha-1. (3) UW-003 produced 5.50 t ha-1in generation S1and reduced in generation S5became 3.13 t ha-1. (4) UW-004 produced 5.67 ton ha-1in generation S1and reduced in generation S5became 3.50 t ha-1. (5) UW-005 produced 5.40 t ha-1in generation S1and reduced in generation S5 became 3.17 t ha-1. Lamuru, which was generated from open pollinated breeding, produced relatively stable yield from generation S1for about 8.53 t ha-1to generation S5for about 7.67 t ha-1.As well as Bismagenerated from open pollinated breeding that produced relatively stable yield from generation S1for about 8.70 t ha-1to generation S5for about 8.03 t ha-1.

Data of the research showed a shift of genetic constitution on inbred lines, so that the plants become homozygote and to be more uniform in generation S5 than the previous ones. Data of the research showed that plant height and yield of grains reduced from generation S1to generation S5. Formation of inbred lines through selfing in inbreeding depression technique takes time up to several generations. Selfing in maize may change its genetic constitution into homozygote, which is identified by their uniform appearances. Even though they are uniform, the inbred lines of maize showed weak growth and low seed production due to the removal of the recessive genes and low adaptability. Inbred lines are more easily affected by environmental stress than the hybrids (Hoecker *et al*. 2008; Troyer and Wellin 2009; Oliveira, Zanotto, Milton Krieger &Vencovsky, Kustanto, Basuki, Kasno&Sugiharto, 2012; Pekkala, Knott, Kotiaho, Nissinen & Puurtinen, 2014; Stepfanie *et al*. 2017).This phenomenon shows that self-pollination in maize produces low yields is identical with the prohibition ofhumans incest which will result in congenital defects, low quality generations as well as mortality. Pollination of corn particularly is written in the word of God "*And We have sent the fertilizing winds and sent down water from the sky and given you drink from it. And you are not its retainers*”(QS al-Hijr: 22). This verse explains clearly that winds play a role in the process of pollination. The word “*fertilizing winds*” in the verse refers is subject of mating and the actors is human who pollinate of male (pollen) to female (ovary).

Results of the inbreeding process usually show the traits of plant height, as well as shorter and uniform ears (Zsubori, Gyenes-Hegyi, Illés,Pók,Rácz,Szőke. 2011). Plant height, stem strength, and position of the ears are very important in plant breeding in order to produce varieties, which resistant to fall down, Such fallen plant may create the yield loss. Traits of plant such as numbers of kernel, growth rate of all kernels, individual kernel, and photosynthetic process in inbred lines are more limited than their hybrids. Other indication that causes the hybrids have better photosynthetic than their inbred lines is due to the hybrid has bigger kernel (Poehlman, 1983; Kustanto, Basuki,Kasno&Sugiharto, 2012; Ding *at al*. 2014). Itpointed that both of incest of human or inbreeding of maizehave high negative impacts. The fact that cross pollination in maize will produce better yield characters, as indicated in al-Quran for humans who are created by God with nations and tribes to know each other in order to become more qualified human beings (QS al-Hujurat : 13).

Trait of plant height shows lowgenotypic coefficient of variation and high heritability. Meanwhile, yield of grains shows medium-high genotypic coefficient of variation and high heritability. Low variability in a population indicates that the population has uniform individual, on the contrary, high variability in a population indicates that individuals in that population are not uniform(Fehr, 1994). High genetic variability in a trait and followed by high heritability indicate that the genetic factor is more dominant in affecting than the environmental factor. Atraitthat has medium–high heritability indicates that environment does not play too much in such character appearance (Whirter, 1979; Eid, 2009; Tripathi, Verma, Singh1, Singh2& Kumar, 2017).It showed that genetic factors are a gift from God to face challenges and maintain the quality of individuals in competition inside population and outside populations keep their survival.

Domestication of animals and plants is supporting of inbreeding depression and increase the proportion of deleterious variants and reduce genetic variation (Lam *et al*. 2010; Makino, Rubin, Carneiro, Axelsson, Andersson, and Webster, 2018). On animals, expression of the reducing appearance due to inbreeding depression is varied among species. Some species show the symptoms of inbreeding depression quickly, while other species show slow inbreeding depression symptoms, even some species do not show any symptom (Barczak, Wolc, Wojtowski, Slosarz, 2009). Inbreeding depression in animals may increase the recessive traits and cause genetic decline that will effect on the animal’s health. On buffaloes, high inbreeding was indicated by percentage of occurrence and low productivity (Praharani, Juarini&Budiarsana, 2009). Inbreeding depression in cows may reduce the production of milk 9.84 – 29.6 kg, fat milk 0.55 – 1.08 kg and protein 0.80 – 0.97 kg (Croquet, Mayeres, Gillon, Vanderick&Genler, 2006). Inbreeding depression on White Leghorn will tend to reduce egg production and delay its maturity (Sewalem, Johansson, Wilhemson&Lillpers, 1999) Inbreeding on pink pigeon reduces the egg fertility, adulthood growth, and ability to live being adult ([Swinnerton](https://www.cambridge.org/core/search?filters%5BauthorTerms%5D=Kirsty%20J.%20Swinnerton&eventCode=SE-AU), [Groombridge](https://www.cambridge.org/core/search?filters%5BauthorTerms%5D=Jim%20J.%20Groombridge&eventCode=SE-AU), [Jones](https://www.cambridge.org/core/search?filters%5BauthorTerms%5D=Carl%20G.%20Jones&eventCode=SE-AU)&[Burn](https://www.cambridge.org/core/search?filters%5BauthorTerms%5D=Robert%20W.%20Burn&eventCode=SE-AU), 2004).Inbreeding to the ancestors of thoroughbred horses has variable effects on fitness (Todd, Ho, Thomson, Ang, Velie& Hamilton, 2017). The facts is an additional phenomenon in animals and plants, further strengthening that incest in humans (Surat al-Nisa ': 23) is also negative for the quality of life of beings.

On human beings, marriage between close relatives (incest) will result physical defects on their descendants and they may be susceptible to various diseases, reduce sexual reproduction and even lead to barrenness. Meanwhile, marriage between distant relatives may bring about excellent descendants who are better than their parents in every aspect. Modern science also suggest that marriage between close relatives will cause recessive traits that will bring out some hereditary diseases, for example, Inbornerror of metabolism, Wilsons Disease, Taysacslaprae, andalkaptunoria. Such hereditary diseases on human, particularly in recessive traits, will emerge clearly on marriage between close relatives (Paige, 2010). Inbreeding depression on human had a highly significant inverse association between height and genome-wide homozygosity which reported a height reduction of up to 3 cm in the offspring of first cousins compared with the offspring of unrelated individuals (McQuillan *et al.* 2012). Degrees of inbreeding significantly associated with depression in intellectual behaviors among children and effects of inbreeding influenced to mental health and cognitive efficiency of the children (Fareed and Afzal, 2014).

Phenomenon of the inbreeding depression has been implied in the al-Quran (QS al-Nisa’: 23) as well as strengthens the content of Al-Quran that contains science, such as: “Read: In the name of Lord Who creates. He creates man from a clot. Read: And the Lord is the Most Bounteous, Who teaches by the pen. Teaches man that which he knew not.”**(QS. al-‘Alaq: 1-5. Other verse implies**Said: “Are those who know equal with those who know not? But only men of understanding will pay heed”**(QS. al-Zumar: 9). A review on phenomenon of inbreeding depression in maize, which gives lesson about the danger of inbreeding (incest) in accordance with the commandment of Allah SWT *“And indeed, for you in grazing livestock is a lesson. We give you drink from what is in their bellies – between excretion and blood – pure milk, palatable to drinkers*”(QS. al-Nahl: 66).**

**Phenomenon of inbreeding depression in maize, which causes declining traits of the plant, such as plant height and yield of grains, as implied in the commandment of Allah SWT “**And within the land are neighboring plots and gardens of grapevines and crops and palm trees, (growing) several from a root or otherwise, watered with one water; but We make some of them exceeds others in (quality of) fruit. Indeed in that are signs for people who reason”**(QS. al-Ra’d: 4).**

**Other verse about traits of the inbreeding yield is implied in a parable:** that the life in the world, which disobeys the religion, is like plant that becomes (scattered) debris: *“Know that the life of this world is but amusement and diversion and adornment and boasting to one another and competition in increase wealth and children – like the example of a rain whose (resulting) plant growth pleases the tillers; then it dries and you see it turned yellow; then it becomes (scattered) debris. And in the Hereafter is severe punishment and forgiveness from Allah and approval. And what is the worldly life except the enjoyment of delusion”* (QS al-Hadid: 20).

All processes in life, which include in inbreeding phenomenon, are parts of Allah SWT’s plan in accordance with the verse “*And He it is Who sendeth down water from the sky, and therewith We bring forth buds of every kind; We bring forth the green blade from which We bring forth the thick-clustered grain; and from the date-palm, from the pollen thereof, spring pendant bunches; and (We bring forth) gardens of grapes, and the olive and the pomegranate, alike and unlike. Look upon the fruit thereof, when they bear fruit, and upon its ripening. Indeed, herein verily are portents for people who believe”* (QS al-An’am: 99).

From the description above, shows how the verses of the al-Quran provide scientific inspiration of cultivation, breeding, and plants engineering, including inbreeding which is then able to provide the foundation in hybrid breeding plants to produce superior varieties even if applied to humans will cause negative impacts on human survival, as implied in QS al-Nisa ': 23. This is natural, because genetic engineering is always open, implied in al-Quran: “Glory be to Allah Who created all things in pairs: the plants of the earth, mankind themselves and other living things which they do not know” (QS Yasin: 36). The word "grown by the earth and from themselves and from what they do not know", in the context of Maize contains the meaning of (1) the genetic nature of maize by the earth, (2) humans as corn cultivators, and (3) the development of genetic engineering technology as development. Thus the Al-Quran still provides opportunities for humans to carry out various genetic engineering at other times.

**CONCLUSIONS**

Based on the previous research and review, some conclusions are drawn as follow: (1) The scientific truth of the al-Quran which prohibits incest for humans in QS al-Nisa ': 23 is proven to be identical and also applies in maize, (2) Inbreeding depression in maize caused reduction and death onheight of crop and yield of grains, such as:(a) UW-001 yielded 6.07 t ha-1at generation S1and reduced at generation S5became 1.93 tha-1, (b) UW-002 yielded 7.73 t ha-1at generation S1and reduced at generation S5became 3.50 tha-1, (c) UW-003 yielded 5.50 t ha-1at generation S1and reduced at generation S5became 3.13 tha-1, (d) UW-004 yielded 5.67 t ha-1at generation S1and reduced at generation S5became 3.50 tha-1, and (e) UW-005 yielded 5.40 t ha-1 at generation S1and reduced at generation S5became 3.17 tha-1, (3) Lamuru, which was generated with open breeding produced relatively stable yield from generation S1for about 8.53 t ha-1to generation S5for about 7.67 t ha-1. As well as Bisma, which generated with open breeding produced relatively stable yield from generation S1 for about 8.70 t ha-1to generation S5 for about 8.03 ton ha-1, and (4) al-Quran (QS Yasin: 36) provides opportunities for other researchers to conduct other trials to prove the truth of the scientific miracles of the al-Quran

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