AGRIVITA Journal of Agricultural Science. 2019. 41(2): 385–393

AGRIVITA
Journal of Agricultural Science
www.agrivita.ub.ac.id

Phenomenon of Inbreeding Depression on Maize in Perspective of The Quran

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ARTICLE INFO

Keywords:
Agriculture
Biology
Inbreeding depression
Maize
The Quran

Article History:
Received: September 19, 2018
Accepted: 31 May, 2019

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ABSTRACT

The objectives of this study were to learn and prove the truth and scientific miracles of The Quran, specifically the prohibition of incest for humans, also applies and affects especially on the growth and yield in particularly open pollinated plants such as maize through 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 from generation of S1 to S5. Lamuru and Bisma which were generated with an 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) that tended to decline and die, while Lamuru and Bisma tended to be stable. It is implied in letters of The Quran, which forbid inbreeding for human 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 Quran which prohibits incest for humans are proven to be identical and also apply in maize.

INTRODUCTION

The tenet of Islam revealed to the Prophet Muhammad were as a mercy to the worlds (The Quran 21: 107 (Translated by T. Itani)), the blessing was to not only for humans, but also animals and plants, including Maize. Maize is a monoecious plant, which has a separate *tassel* (male flower) and *silk* (female flower) in the same plant (Ray (1627-1705). (Moreira, Silva, Silva, Dombroski, & Castro, 2010; Porter, 1959; Weatherwax, 1916; Westergaard, 1958). In general, maize has cross pollination, and the range of the pollen grains may reach 50 m (Bannert, Vogler, & Stamp, 2008; Jones & Newell, 1948) 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 and 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 by providing fresh air because corn plants produce oxygen needed by humans and other creatures, so it becomes the good deed of the actor (farmer) until doomsday. It is in line with hadith of the Prophet: "The goal of Muslim to cultivate plants is to produce 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 in humans and corn, male and female cells that are always paired. Even The Quran calls the pair (*zawj-azwaj*) at least 34 times used for humans and animals. And specifically related to a pair of plants, is called at least 9 times, namely: The Quran 36: 36; 43:12; 22: 5; 26: 7; 31:10; 46: 7; 13: 3; 51: 49; 20: 53.

On the basis of pairing, humans have the nature to marry. Marriage is commanded by The Quran (4: 3; 4: 25; 24: 32), but on the other hand there is a prohibition on marrying blood relatives, with His Words "*Forbidden for you are your mothers, your daughters, your sisters, your paternal aunts, your maternal aunts, your brother's daughters, your sister's daughters, your fostermothers who nursed you, your sisters through nursing, your wives' mothers, and your stepdaughters in your*

ISSN: 0126-0537 Accredited First Grade by Ministry of Research, Technology and Higher Education of The Republic of Indonesia, Decree No: 30/E/KPT/2018

Cite this as: Ali, M., Kuswanto, & Kustanto, H. (2019). Phenomenon of Inbreeding Depression on Maize in Pespective of The Quran. *AGRIVITA Journal of Agricultural Science, 41*(2), 385–393. http://doi.org/10.17503/agrivita.v41i2.2022

guardianship— born of wives you have gone into— but if you have not gone into them, there is no blame on you. And the wives of your genetic sons, and marrying two sisters simultaneously. Except what is past. Allah is Oft-Forgiving, Most Merciful" (The Quran 4:23). If the ban is violated, marriage within bloodrelation will cause reproductive problems such as 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 it will return to show its superior characteristics when crossed again with different relatives which has long genetic distance.

Many efforts concerning 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 bacause maize has cross pollination and heterozygous heterogeneous (Kustanto, Basuki, Sugiharto, & Kasno, 2012; Nagamitsu & Futamura, 2014; Shull, 1908; Winn et al., 2011). 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. The characters of plant with vigor decline werecaused by the self-pollination and 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 (Kustanto, Basuki, Sugiharto, & Kasno, 2012; Pekkala, Knott, Kotiaho, Nissinen, & Puurtinen, 2014; Poehlman, 1979).

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 S_0, and the progeny from self-pollination of the plant is so-called S_1 (progeny from self-pollinationof the first generation). Progeny from self-pollination of the second generation is so-called S_2, and so on (Cheng, Williams, & Zhang, 2012; Jaradat & Goldstein, 2018; Kustanto, Basuki, Sugiharto, & Kasno, 2012; Poehlman, 1979). The lost vigor during self-pollination period was regained on progeny $F_1$when the inbred line was crossbred with other inbred lines, which had no correlation (Pekkala, Knott, Kotiaho, Nissinen, & Puurtinen, 2014; Poehlman, 1979).

The phenomenon of such as inbreeding depression is actually implied in the verses of The Quran, but some difficulties found to connect it, so the facts about the truth of science and scientific methods and The 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 (The Qur'an 4:23) with the phenomenon of inbreeding depression in Maize using scientific methods.

MATERIALS AND METHODS

Experiments and preparation of the experiment materials were conducted in Purwodadi, Grobogan, Central Java. The research was conducted from October 2011 – December 2016. The materials of the research were 6 inbred lines of the 1st generation (S_1) to the 5th generation (S_5), such as: UWS-01, UWS-02, UWS-03, UWS-04, and UWS-05 at generations S_1, S_2, S_3, S_4, and S_5, which derived from inbreeding depression of the commercial varieties in Indonesia. Bisma and Lamuru as check varieties.The research was conducted by planting 6 genotypes of inbred line and 2 genotypes of check from each generation with RCBD 3 replications.

The data of the observation results of the whole tested genotypes were analyzed using analysis of variance. The linear additive model of the RCBD is as follows:

$X_{ijkl} = \mu + g_{ijk} + b_l + \sum_{ijkl}$ ……................................... 1)

which:

X_{ijkl} : value of the observed traits at the-*ijk* genotype, the 1st group

μ : effect of median value of the population from the observed traits

g_{ijk} : effect of the-*ijk*genotype on the observed traits

b_l : effect of the 1st group on the observed traits

$\sum_{ijkl}$: 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:

$LSD = t_{\alpha/2}\ (2s^2/r)^{1/2}$ ………….......................... 2)

which:

$t_{\alpha/2}$: t value at level-α
s^2 : error of Mean Squares(MS_e)
r : number of replication

In order to find out variability among genotypes, the equation of Genotypic *coefficient* of variation:

$GCV\ \% = \frac{\sqrt{genetic\ variance}}{\bar{x}} \times 100\%$ ………3)

Genetic variance (σ^2_g) $= (MS_g - MS_e)/r$ ………4)

$\sigma^2_g = \sigma^2_f - \sigma^2_e$ ....……5)

which:

$\bar{x}$: average population
MS_g : an estimate of mean square of tested accession
MS_e : an estimate of mean square of error
r : replication
σ^2_f : phenotypic variance
σ^2_e : environmental variance/error

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:

$H_2 = (\sigma^2_g/\sigma^2_f)$ …….. 6)

which :

H_2 : Heritability
σ^2_g : Genotypic variance
σ^2_f :Phenotypic variance

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.

The average values of the plant height for all genotypes on generation are as follow: S_1 had average value of 209.36 cm, the lowest value of UW-01 was 198.33 cm and the highest value of UW-04 was 226.67 cm. The average values of the plant height for all genotypes on generation S_2 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. The average values of the plant height for all genotypes on generation S_3 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.

Table 1. Average plant height (cm) of Inbred lines on generation S_1-S_5in comparison with the check

Inbred lines	S_1	Inbred lines	S_2	Inbred lines	S_3	Inbred lines	S_4	Inbred lines	S_5
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
H_2	52.35	H_2	44.86	H_2	57.23	H_2	74.62	H_2	93.11

Remarks: S_1= 1st Generation, S_2= 2nd Generation, S_3= 3rd Generation, S_4 = 4th Generation, S_5= 5th Generation, Sign.=Significance, Ns = not significant, * = significant, LSD =Least Significant Difference, CV= Coefficient of variation, GCV= Genetic coefficient of variation, H_2= Heritability

The average values of the plant height for all genotypes on generation, S_4 had a significant difference with the average value of 188.57 cm. The average values of plant height for all genotypes on generation S_5 showed significant difference with the average value of 184.58 cm, the lowest value of UW-01 was 152.70 cm. The Coefficient of variance (CV) on all generations of the experiments S_1-S_5 ranged between 5.56 – 9.21%. The Coefficient of variance on genetic for all generations of experiments S_1-S_5 ranged between 5.83 – 20.77%. The heritability on all generations of experiments S_1-S_5 ranged between 44.86 – 93.11%. The average values of the grains yield are presented in Table 2.

The average values of the grains yield for all genotypes on generation S_1 showed a significant difference with the average value was 6.80 t/ha, the lowest value of UW-05 was 5.40 t/ha, and did not show a significant difference with UW-01, UW-04, and UW-03, while the highest value of Lamuru was for about 8.70 t/ha and did not show a significant difference with Bisma. The average values of the grains yield for all genotypes on generation S_2 showed a significant difference with the average value of 6.34 t/ha, the lowest value of UW-04 was 4.97 t/ha,and did not show any significant difference with UW-03, UW-01, and UW-05, while the highest value ofLamuru was for about 8.57 t/ha and did not show any significant difference with Bisma. The average values of the grains yield for all genotypes on generation S_3 showed a significant difference with the average value of5.86 t/ha, the lowest value of UW-03 was 4.40 t/ha, and did not show any significant difference with UW-05, UW-01, and UW-04, while the highest value of Lamuru was for about 8.07 t/ha and did not show any significant difference with Bisma.

The average values of the grains yield for all genotypes on generation S_4showed a significant difference with the average value of 5.15 t/ha, the lowest value of UW-05 was 3.53 t/ha, 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 and did not show any significant difference with Lamuru. The average values of the grains yield for all genotypes on generation S_5showed a significant difference with average value of 4.42 t/ha, the lowest value was UW-05 for about 1.93 t/ha, while the highest value was Lamuru for about 8.03 t/ha and did not show any significant difference with Bisma. The Coefficient of variance (CV) on all generations of experiments S_1-S_5 ranged between 5.55-8.86%. The Coefficient of variance on genetic for all generations of experiments S_1-S_5 ranged between 36.77-94.05%. The heritability on all generations of experiments S_1-S_5 ranged between 95.96-99.56. The average yield of grains for each inbred line generation in comparison with Bisma and Lamuru on generations S_1-S_5 are presented in Fig. 1.

Table 2. Average Yield of Grains (t/ha) of Inbred lines from generation S_1-S_5 in comparison with the check

Inbred line	S_1	Inbred line	S_2	Inbred line	S_3	Inbred line	S_4	Inbred line	S_5
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
H_2	96.49	H_2	95.96	H_2	98.52	H_2	99.39	H_2	99.56

Remarks: S_1= 1st Generation, S_2= 2nd Generation, S_3= 3rd Generation, S_4 = 4th Generation, S_5= 5th Generation, Sign.=Significance,* = Significant, LSD =Least Significant Difference, CV= Coefficient of variation, GCV= Genetic coefficient of variation, H_2= Heritability

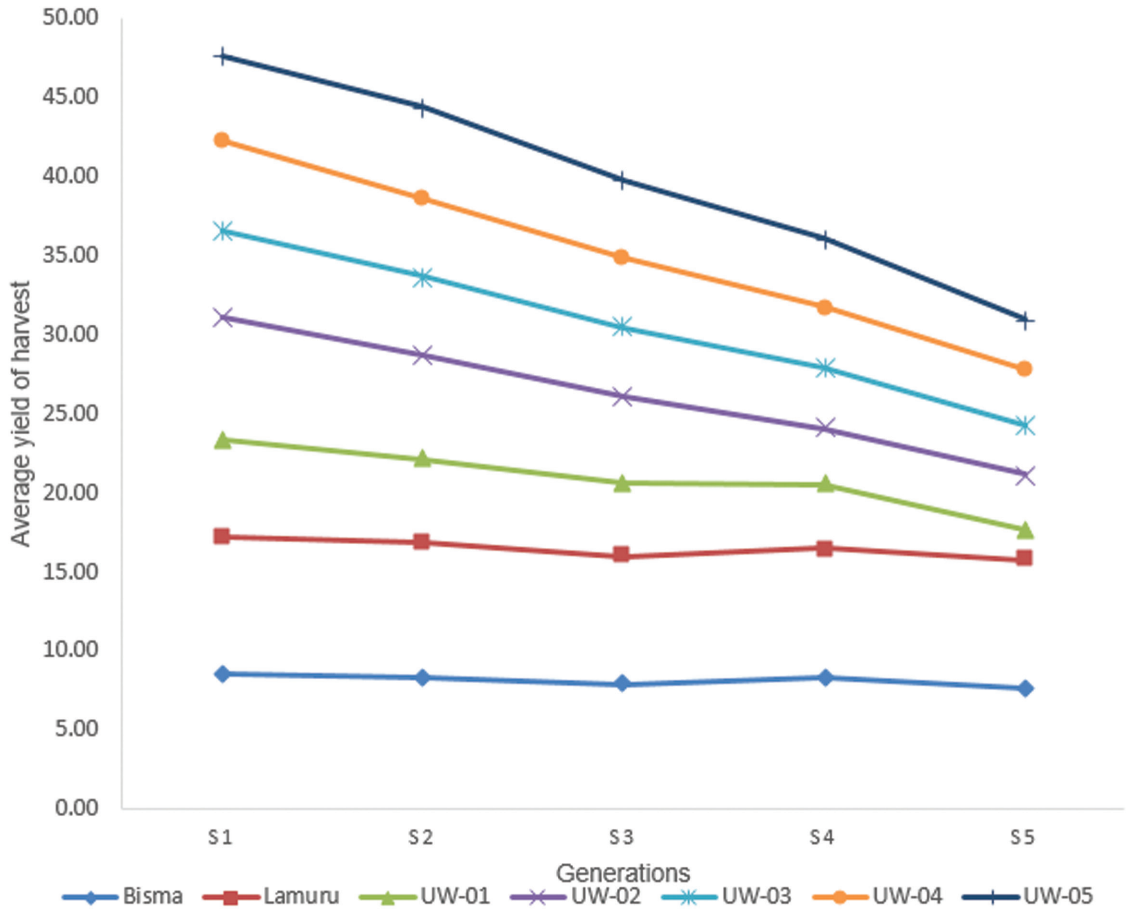

Fig. 1. The average yield of harvest in each inbred line in comparison with Bisma and Lamuru on generations S_1-S_5

The average yield of each tested genotype of inbred line showed some reduction of yield, such as: (1) UW-001 produced 6.07 t/ha in generation $S_1$and reduced in generation S_5became 1.93 t/ha. (2) UW-002 produced 7.73 t/ha in generation S_1 and reduced in generation S_5 became 3.50 t/ha. (3) UW-003 produced 5.50 t/ha in generation $S_1$and reduced in generation S_5 became 3.13 t/ha. (4) UW-004 produced 5.67 t/ha in generation S_1 and reduced in generation S_5 became 3.50 t/ha. (5) UW-005 produced 5.40 t/hain generation S_1 and reduced in generation S_5 became 3.17 t/ha. Lamuru, which was generated from open pollinated breeding, produced relatively stable yield from generation $S_1$for about 8.53 t/hato generation S_5 for about 7.67 t/ha. As well as Bisma which generated from open pollinated breeding produced relatively stable yield from generation S_1 for about 8.70 t/ha to generation $S_5$for about 8.03 t/ha.

The data showed a shift of genetic constitution on inbred lines, so that the plants become homozygote and to be more uniform in generation S_5 than the previous ones. The data also showed that plant height and yield of grains reduced from generation S_1 to generation S_5. The 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. Actually, this is always detrimental, but this method is one of the plant breeding solutions. 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 (Aguillon et al., 2017; de Oliveira, Zanotto, Krieger, & Vencovsky, 2012; Hoecker et al., 2008; Kustanto, Basuki, Sugiharto, & Kasno, 2012; Pekkala, Knott, Kotiaho, Nissinen, & Puurtinen, 2014; Troyer &Wellin, 2009).

This phenomenon shows that self-pollination in maize produces low yields is identical withthe prohibition of humans 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: "*We send the fertilizing winds; and send down water from the sky, and give it to you to drink, and you are not the ones who store it*" (The Quran15:22).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).

The results of the inbreeding process usually show the traits of plant height, as well as shorter and uniform ears (Zsubori et al., 2002). 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 bigger kernel (Ding et al., 2014; Kustanto, Basuki, Sugiharto, & Kasno, 2012; Poehlman, 1979). It pointed that both of incest of human or inbreeding of maize have high negative impacts. The fact that cross pollination in maize will produce better yield characters, as indicated in The Quran for humans who are created by God with nations and tribes to know each other in order to become more qualified human beings (The Quran 49:13).

Trait of plant height showed lowgenotypic *coefficient* of variation and high heritability. Meanwhile, yield of grains showed medium-high genotypic *coefficient* of variation and high heritability. The 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, 1991). A high genetic variability in a trait and followed by high heritability indicated that the genetic factor is more dominant than the environmental factor. Atraitthat has medium–high heritability indicates that environment does not play too much in such character appearance (Eid, 2009; McWhirter, 1979; Tripathi, Verma, Singh, Singh, & 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 supportthe inbreeding depression and increase the proportion of deleterious variants and reduce genetic variation (Lam et al., 2010; Makino et al., 2018). On animals, the expressions of the reducing appearance due to inbreeding depression vary 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, Wójtowski, Ślósarz, & Szwaczkowski, 2009). Inbreeding depression in animals may increase the recessive traits and cause genetic decline that will affect 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, & Gengler, 2006). Inbreeding depression on White Leghorn will tend to reduce egg production and delay its maturity (Sewalem, Johansson, Wilhelmson, & Lillpers, 1999) Inbreeding on pink pigeon reduces the egg fertility, adulthood growth, and ability to live being adult (Swinnerton, Groombridge, Jones, Burn, & Mungroo, 2004). Inbreeding to the ancestors of thorough bred horses has variable effects on fitness (Todd et al., 2018). The facts is an additional phenomenon in animals and plants, further strengthening that incest in humans (The Quran 4:23) 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. While, marriage between distant relatives may bring excellent descendants who are better than their parents in every aspect. Modern science also suggests that marriage between close relatives will cause recessive traits that will bring out some hereditary diseases, for example, Inborn-error of metabolism, Wilsons Disease, and alkaptunoria. Such hereditary diseases on human, particularly in recessive traits, will emerge clearly on marriage between close relatives (Paige, 2010). Inbreeding depression on human has 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 & Afzal, 2014).

Inbreeding depression has been implied in The Quran (4:23) as well as strengthens the content of The Quran that contains science, such as: "*Read: In the Name of your Lord who created. Created man from a clot. Read: And your Lord is the Most Generous. He who taught by the pen. Taught man what he never knew"* (The Quran 96: 1-5). Other verse implies *Said: "Are those who know and those who do not know equal? Only those possessed of reason will remember"* (The Quran 39: 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 there is a lesson for you in cattle: We give you a drink from their bellies, from between waste and blood, pure milk, refreshing to the drinkers*" (The Quran 16:66).

The 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 **"***On earth are adjacent terrains, and gardens of vines, and crops, and date-palms, from the same root or from distinct roots, irrigated with the same water. We make some taste better than others. In that are proofs for people who reason"* (The Quran 13:4).

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 worldly life is only play, and distraction, and glitter, and boasting among you, and rivalry in wealth and children. It is like a rainfall that produces plants, and delights the disbelievers. But then it withers, and you see it yellowing, and then it becomes debris. While in the Hereafter there is severe agony, and forgiveness from Allah, and acceptance. The life of this world is nothing but enjoyment of vanity"* (The Quran 57:20).

All processes in life, which include in inbreeding phenomenon are parts of Allah SWT's plan in accordance with the verse "*And it is He who sends down water from the sky. With it We produce vegetation of all kinds, from which We bring greenery, from which We produce grains in clusters. And palm-trees with hanging clusters, and vineyards, and olives, and pomegranates—similar and dissimilar. Watch their fruits as they grow and ripen. Surely in this are signs for people who believe."* (The Quran 6:99).

The description above shows how the verses of The 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 The Quran 4:23. This is natural, because genetic engineering is always open, implied in The 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" (The Quran 36:6). 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 Quran still provides opportunities for humans to carry out various genetic engineering at other times.

CONCLUSION

Based on the previous research and review, some conclusions are withdrawn as follow: (1) The scientific truth of The Quran which prohibits incest for humans in The Quran 4:23 is proven to be identical and also applies in maize, (2) Inbreeding depression in maize caused reduction and death on height of crop and yield of grains, such as:(a) UW-001 yielded 6.07 t/ha at generation S_1 and reduced at generation S_5 became 1.93 t/ha, (b) UW-002 yielded 7.73 t/ha at generation S_1 and reduced at generation S_5 became 3.50 t/ha, (c) UW-003 yielded 5.50 t/ha at generation S_1 and reduced at generation S_5 became 3.13 t/ ha, (d) UW-004 yielded 5.67 t/ha at generation S_1 and reduced at generation S_5 became 3.50 t/ha, and (e) UW-005 yielded 5.40 t/ha at generation S_1 and reduced at generation S_5 became 3.17 t/ha, (3) Lamuru, which was generated with open breeding produced relatively stable yield from generation S_1 for about 8.53 t/ha to generation S_5 for about 7.67 t/ha. As well as Bisma, which generated with open breeding it produced relatively stable yield from generation S_1 for about 8.70 t/hato generation S_5 for about 8.03 t/ha, and (4) The Quran (36:36) provides opportunities for other researchers to conduct other trials to prove the truth of the scientific miracles of The Quran.

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