Effect of Rotation Number on Parameter of Fertilisation of Poligamously Mating Domestic Pigeons (Columba Livia L.)

by

C. C. Nwosu[1] and R. Beuing
Institut fur Tierzucht and Haustiergenetik,
Justus Liebig—Universitat Giessen, West Germany.

ABSTRACT

IN the rotation method to break the monogamous mating habits, 24 male and 24 female racing pigeons were used. They were divided into three groups, each consisting of 8 male and 8 female pigeons put separated in three huts A,B,C. At the first rotation (Second mating) female pigeons of hut A were moved to hut B; all female pigeons of hut B to hut C while female pigeons of hut C took the place of female pigeons of hut A. The females were rotated sequentially three times and the male pigeons three times also. With regard to percentage fertilization and productivity rate, there were no significant differences at 5% level ($P > 0.05$) among the rotations. The regression ($b = 0.72\%$) of percentage fertilization on rotation number and the regression ($b = -0.89\%$) of productivity rate on rotation number were found not to be significantly different from zero. The correlation coefficients attached to both regressions ($r = 0.41$ and $r = -0.34$) respectively were not significant at 5% level. The rotational mating method did not depress the parameters of fertility tested and is, as such a useful tool to induce pigeons to sequential polygamy.

INTRODUCTION

The house pigeon can be bred as a hobby bird for its colour and form, for meat production and for sporting (racing pigeons). However, the monogamous mating habit of pigeons does not allow for elite matings and accurate calculation of breeding value of individuals nor of population parameter such as heritability of a trait and genetic correlation between traits. To be able to calculate these population parameters it becomes necessary, at least through biotechnical means, to convert pigeons from monogamously to polygamously mating birds. This report is based on the results of an experiment conducted by the authors to break the monogamy of pigeons. Apart from the work of Beuing (1971) Beuing (1973, Nwosu and Beuing (1973) there are no other works in literature relating directly to polygamising pigeons.

The objective of the experiment was firstly to assure that pigeons have the same polygamous mating patterns as is the case among other farm birds and animals and secondly, to assure that population genetic methods can be applied also to pigeons so that in any analysis the genetic or environmental contribution to population parameters could be segregated.

MATERIALS AND METHODS

48 racing pigeons ("Brieftauben") made up of 24 males and 24 females were randomly selected from the flock of racing pigeons at the experimental station of the Justus Liebig—University in the City of Giessen, West Germany. All pigeons were on the average 9 months old at the start of the experiment. There were 7 matings in all with three rotations of the female pigeons and three rotations of the male pigeons. The first mating of 8 male and 8 female pigeons in each hut served as control; thereafter the females were rotated sequentially from the second to the fourth mating whereas the males were rotated in order from the fifth to the seventh, mating. The experiment was carried out from 30th April, 1974 to 30th October, 1974 – Spring, summer and early fall seasons in West Germany – when pigeons reproduced well.

The method used in carrying out the rotational mating was that suggested by Beuing (1973) in his theory of polygami-

1. C. C. Nwosu is currently a Lecturer in the Department of Animal Science, University of Nigeria, Nsukka Nigeria.

sing pigeons. There well-lit and well-aerated huts (A, B, C), each measuring 1·5m wide X 2·5m long and 2m high were used to house the pigeons throughout the period of the experiment. Each hut had identical pigeon stalls of 8 nesting cells bringing the total number of male pigeons for all three huts to 24 and also 24 female pigeons were accommodated. There was no way in which pigeons of one hut could see pigeons of another hut and all experimental birds remained indoors. A plastic egg laying nest and sufficient nesting straw were made available in each nesting cell. All pigeons were fed centrally ad libitum on the floor of each hut with a standard Hessen (state in W. Germany) pigeon ration containing 15% protein fortified with vitamin and mineral supplements. Water was always available. At the start of the experiment 8 male pigeons were put in each of the three huts (N=24). As a result of a former one month separation of both sexes, the random pair formation occurred very fast indeed. By the use of a combination of coloured plastic rings on the legs of the pigeons, one could easily establish the mating pair without resort to catching them. The birds were observed daily and protocols were made. A female pigeon lays only two eggs in any laying period—one egg every other day but the laying interval is 40 days on the average. As soon as an egg was laid it was taken to the incubator. An artificial pigeon egg made of $CaCO_3$ was laid on the nest instead. An egg was regarded as fertilized if it showed anastomosing blood system on being candled on the 6th day of incubation. It should be noted that the 24 females at any laying period were expected to lay 48 eggs. Any egg that remained uncracked until fertilization could be ascertained was "valuable" but "invaluable" if it got cracked. All uncracked eggs were used to value the laying performance and suitability of the rotation method. The two parameters of fertilization used were:

(i) the percentage fertilization (PF) represented the number of fertilized eggs expressed in percent of the uncracked ("valuable") eggs of the total eggs (total eggs may be less than the expected 48 eggs) laid by all the females that laid at the time (some female pigeons may not lay in every period).

(ii) the productivity rate (PR) was the ratio of the actual fertilized eggs to the 48 expected fertile eggs in any laying period, expressed in percent. This measure of productivity rate in the above experiment was used in a limited sense since the day-old pigeon chicks were not raised to weaning. They were discarded after certification of fertility.

At the end of a rotation period (N=6) that is, after allowing the pigeons 10 days to brood the artificial eggs, all the gypsum eggs were removed on the evening of that day to allow a progressive decline of brooding courts. On the following morning the pigeons were rotated orderly. For the first rotation, females from hut A occupied hut B and females of hut B occupied hut C while female pigeons of hut C had to find new mates with males of hut A. Meanwhile all the male pigeons maintained their huts. There were altogether 6 rotations plus the initial mating (control) which gave on the whole 7 matings ("rotations"). The female pigeons moved in matings 2 to 4 while the male pigeons moved in matings 5 to 7. This mating system involved essentially three things:-

(a) There was a short circuit in the reproductive cycle. The pigeons —males and females—brooded for only about 10 days instead of the normal 17 days

(b) The interval of laying was cut by a half because the pigeons were made to lay in 20 day-intervals instead of normal 40 day—intervals

(c) This polygamising method necessitated that pigeons overcame their monogamous mating habits because individuals had to look for new mates at each rotation.

RESULTS

Table 1 gives the mean percentage of fertilization and the mean productivity rate for each rotation and the control. In analysis of variance for the first egg, F value of 0·67; for the second egg, F value of 0·95; and for both 1. and 2. eggs, F value of 0·80 was calculated. All this is not significant at 5% level of significance, showing that the rotation number had no significant effect on the parameters of fertility. Also in an analysis of variance of productivity rate per pair an F value of 0·52 is not significant at 5% level ($P > 0·05$) showing no significant differences among rotations. From the results above, an average percentage fertilization for 7 mating (including 6 rotations) was found to be 94.20% with a range of 88·88% to 100%. On the other hand, the average productivity rate for 7 matings was found to be 86·31 with a range of 79·16 to 93·75%. Since there were no significant differences among rotations in both cases, no significant regressions ($bpF = 0·72\%$; $bPR = 0·89\%$) and no significant correlations ($rPF = 0·41$; $rPR = -0·34$) were expected.

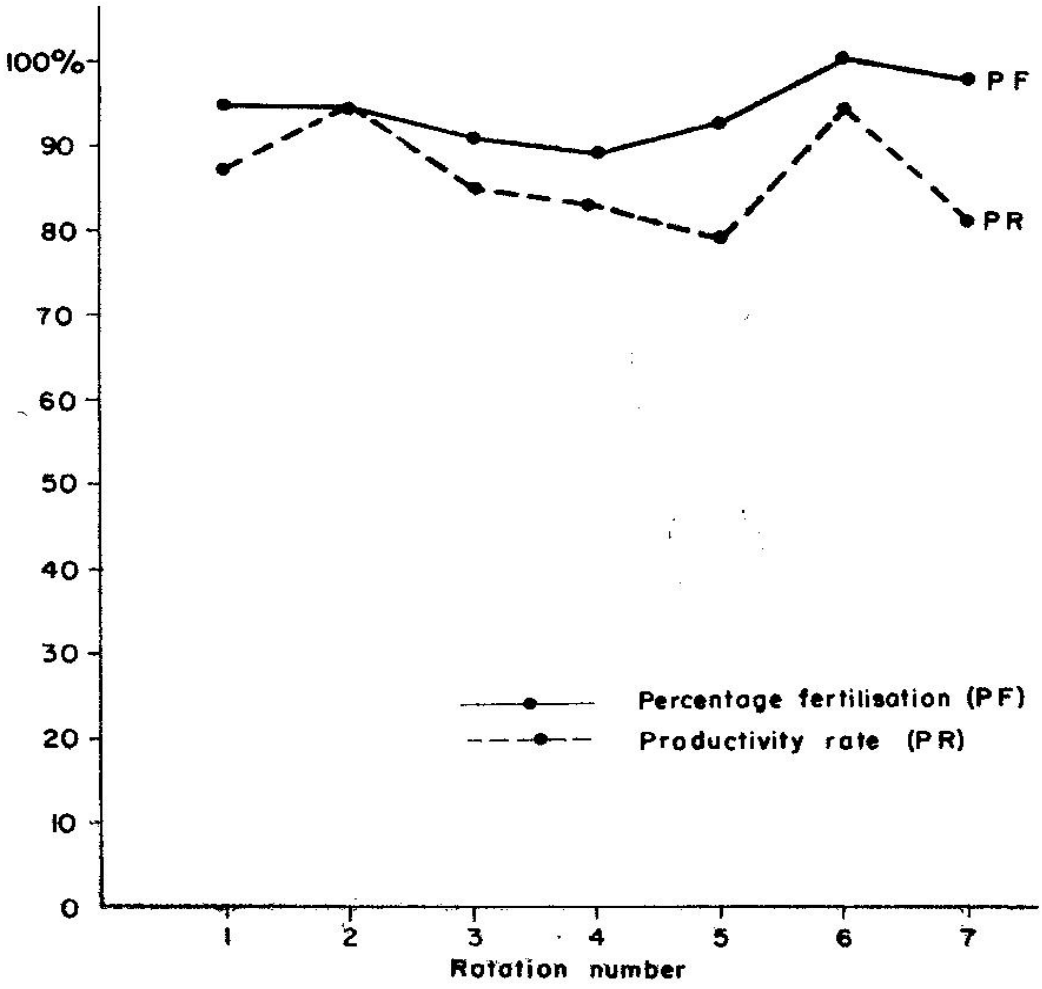

TABLE 1

Parameters of Fertilization in the Rotations

Rot. No.	*Percentage of fertilisation* %	*Productivity rate* %
1. (Control mating)	95·45	87·50
2. (rot. 1)	93·75	93·75
3.	91·11	85·41
4.	88·88	83·33
5.	92·68	79·16
6.	100·00	93·75
7. (rot. 6)	97·50	81·25
$\bar{x}$	94·20	86·31

DISCUSSION

The first mating, which was the control of which the results of the rotations could be compared, representated an ideal situation because the pigeons used were directly from isolation and were, therefore sexually active and representative of a monogamous situation. Since pigeons are monogamous birds, it was feared that their readiness to mating and consequietly the fertilization results in the subsequent rotations should be considerably poorer than in the first mating. The fact that the analysis of variance in the percentage fertilization and productivity rate in the 7 matings was not significant at 5% level indicated that the method of rotation is an accepted method of polygamising pigeons sequentially without any significant decline in fertility of the pigeons. In other words, the number of times pigeons are rotated allowing for a polygamous structure had virtually no influence on the fertility paramcters. The results of the experiment have far reaching implications on restructuring a population of breeding pigeons. A population structure was realised which could enable the calculation of breeding value, heritability and genetic correlation in a progeny tested population of house pigeons.

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REFERENCES

BEUING, R., (1971). Probleme und Möglichkeiten einer wirtschaftlichen Taubenaufzucht und-mast unter deutschen Verhaltnissen (Problems and possibilities of economic pigeon breeding and production under German conditions) Kraftfutter 5, 236—238.

BEUING, R., (1972). Personliche Mitteilung (Personal Communications)

BEUING, R., (1973). Die Durchbrechung der Monogamie bei der Taube durch biotechnische Verfahren und spezielle Haltungsformen. (The theory of the breaking of the monogamy of the pigeon through bio-and keeping techniques) Vortrag anlasslich der Vortragstagung der Gesellschaft fur Tierzuchtwissenschaft 1973 in Giessen.

BEUING, R. UND NWOSU, C.C. (1973). Die Sicherheit gezielter Fremdpaarungen bei Tauben (The certainty of purposeful strange matings of pigeons) Vortrag anlasslich der Vortragstagung der Gesellschaft fur Tierzuchtwissenschaft 1973 in Giessen.