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## **The Effect of Age At First Insemination on Longevity and Lifetime Production Traits in Simmental Cows**

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**Abstract:** The effect of cow age at first insemination on longevity and lifetime production traits was examined in the Simmental cows housed at the “Zlatiborski Suvati” (Mt. Zlatibor Pastures) farm. The general linear model was used to calculate linear regression coefficients for the effect of age at first insemination on longevity traits including the age at culling, the length of productive life, the total number of milking days and the cow utilization index as well as on lifetime production traits being lifetime milk production, the milk fat content of the lifetime milk production, lifetime milk fat production, lifetime production of 4% fat-corrected milk and milk production per milking, productive and lifetime day.

Based upon the calculated linear regression coefficients, the age at first insemination had a very high significant effect ( $P < 0.001$ ) on the age at culling and the cow utilization index ( $b_{xy} = 1.386$  and  $b_{xy} = -0.020$ ) and no significant influence ( $P > 0.05$ ) on other longevity traits. Cow age at first insemination had no significant effect ( $P > 0.05$ ) on the lifetime milk and milk fat production traits.

**Key words:** Simmental breed, regression, longevity, lifetime production

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### **Introduction**

Age at first insemination is being much discussed from both scientific and practical point of view. Sexual maturity of heifers occurs much before breeding maturity that is before heifers reach desired body size and condition. In case of premature breeding of young heifer, despite good nutrition and care, healthy fetus development, proper growth and development of a future cow as

well as milk production particularly during the first lactation often cannot be provided in accordance with genetic potential. Heifers bred too late, on the other hand, due both to overweight and probably the occurrence of fatty degeneration of sexual organs, have lower fertility. Although there are different literature data on the age at first insemination as well as on its effect on the displayed longevity and lifetime production traits, most authors agree that the age in question depends most on breed, nutrition conditions, care and the housing system.

The concept of raising breeding heifers, according to *Zeremski et al., 1989, (citation Trifunovic et al., 1990)* should be based on moderate nutrition intensity providing daily weight gains of 650-750 g and first calving at about two years of age. According to the authors, the first insemination or fertilization of noble breeds of heifers should be conducted when heifers reach the age of 14-16 months and body weight of 320-350 kg (about 65% of the weight of a mature head of cattle).

### Material and Method

The investigation of the effect of age at first insemination on the longevity and lifetime milk and milk fat production traits in 143 Simmental cows was conducted at a dairy cow farm on Mt. Zlatibor. The farm, having a loose housing system and lying boxes (lige boxen), can hold 275 cows with offspring.

The effect of age at first insemination on the displayed longevity and lifetime milk and milk fat production traits was observed through the linear regression coefficients calculated following a general linear model. The model was used to calculate the linear regression coefficients for longevity traits being the age at culling, the length of productive life, the total number of milking days and the cow utilization index as well as for lifetime production traits including lifetime milk production, the content of milk fat of lifetime milk production, lifetime milk fat production, lifetime 4% fat-corrected milk production and milk production per milking, productive and lifetime day.

### Results and Discussion

The effect of age at first insemination on the longevity traits of cows such as the age at culling, the length of productive life, the total number of milking days and the cow utilization index is shown through linear regression calculated following a general linear model.

The effect of age at first insemination on the age at culling and the cow utilization index was statistically very highly significant ( $P < 0.001$ ). The regression coefficient ( $b_{xy}$ ) was positive in the first trait and negative in the second one being 1.386 and -0.020, respectively. The age at first insemination did not have a statistically significant effect ( $P > 0.05$ ) on the length of productive life and the total number of milking days.

*Panic, 1978*, reports a very small participation of age at first calving in the total exposure of the longevity and lifetime production traits being about 3 % at the most. *Lazarevic et al., 1987*, report rather low coefficients of correlation between the

age at first insemination and the length of productive life being 0.11, indicating a very weak interrelation between the two traits (0.02-0.05). In his study on longevity and lifetime production traits in Bulgarian Simmental cows, *Ivanov, 1990*, stressed a very weak correlation between the age at first insemination and the age at culling ( $r=0.21$ ).

Table 1 presents the linear regression coefficients.

Tab. 1. Linear regression coefficients for the effect of age at first insemination on longevity traits of cows following a general linear model

Linear regression coefficients for longevity traits of cows				
	AC (days)	LPL (days)	TNMD (days)	CUI (%)
Age at I insem. ( $b_{xy}$ )	1.386 <sup>***</sup>	0.294 <sup>NS</sup>	0.316 <sup>NS</sup>	-0.020 <sup>***</sup>

N.S. -  $P > 0.05$ ; \* -  $P < 0.05$ ; \*\* -  $P < 0.01$ ; \*\*\* -  $P < 0.001$ ;

The effect of age at first insemination on the lifetime production traits of cows, such as lifetime milk production, the content of milk fat of lifetime milk production, lifetime milk fat production, lifetime 4% fat-corrected milk production and milk production per milking, productive and lifetime day, is presented through linear regression calculated following a general linear model.

Table 2. presents the linear regression coefficients for the lifetime production traits.

Tab. 2. Coefficients of linear regression of the effect of age at first insemination on the lifetime production traits of cows following a general linear model

Linear regression coefficients for lifetime production traits of cows							
	LMP (kg)	MFCLMP (%)	LMFP (kg)	LP4%FCM (kg)	MPMD (kg)	MPPD (kg)	MPLD (kg)
Age at I insem. ( $b_{xy}$ )	4.943 <sup>NS</sup>	-0.00008 <sup>NS</sup>	0.208 <sup>NS</sup>	5.101 <sup>NS</sup>	0.0032 <sup>NS</sup>	0.0034 <sup>NS</sup>	-0.00003 <sup>NS</sup>

N.S. -  $P > 0.05$ ; \* -  $P < 0.05$ ; \*\* -  $P < 0.01$ ; \*\*\* -  $P < 0.001$ ;

Based upon the values of the linear regression coefficients, it could be concluded that the coefficients were very low and statistically insignificant, and that therefore no effect of age at first insemination on the lifetime production traits of cows was recorded. This also confirms the prevailing opinion that the highest effect of cow age at first insemination is exerted on production traits in first lactation.

*Zecevic and Sandor, 1984*, report in their investigations the coefficient of regression between the age at first insemination and milk production per lifetime day of -0.0041, meaning that with each later day of heifer breeding the quantity of milk per lifetime day decreases by 0.0041 kg. According to *Antov, 1986*, the coefficient of regression between the age at first calving and the lifetime quantity of milk in Red and White Lowland breed of cattle is rather low, being  $b_{xy}=3.42$ . *Lazarevic et al., 1987*, report rather low coefficients of correlation between the age at first insemination and lifetime milk and milk fat production (0.02-0.05).

### Conclusion

Based upon the calculated linear regression coefficients for the longevity and lifetime milk and milk fat production traits, the following could be concluded:

- Cow age at first insemination had a very high significant effect ( $P < 0.001$ ) on the age at culling and the cow utilization index ( $b_{xy} = 1.386$  and  $b_{xy} = -0.020$ ), but no significant effect on other traits ( $P > 0.05$ ).
- Cow age at first insemination did not significantly affect ( $P > 0.05$ ) the lifetime milk and milk fat production traits.

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**UTICAJ UZRATA PRI PRVOJ OPLODNJI NA OSOBINE  
DUGOVEČNOSTI I ŽIVOTNE PROIZVODNJE KOD KRAVA  
SIMENTALSKE RASE**

- originalni naučni rad -

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**Izvod**

Uticaj uzrasta krava pri prvoj oplodnji na osobine dugovečnosti i životne proizvodnje ispitivan je kod krava simentalske rase smeštenih na farmi "Zlatiborski suvati". Opštim linearnim modelom izračunati su koeficijenti linearnr regresije uticaja uzrasta pri prvoj oplodnji na osobine dugovečnosti kao što su uzrast pri izlučenju, dužina produktivnog života, ukupan broj muznih dana i indeks iskorišćavanja krava i osobine životne proizvodnje među kojima su životna proizvodnja mleka, sadržaj mlečne masti životne proizvodnje mleka, životna proizvodnja mlečne masti, životna proizvodnja 4% masnog mleka i proizvodnja mleka po muznom, produktivnom i životnom danu.

Na osnovu izračunatih koeficijenata linearne regresije uzrast pri prvoj oplodnji vrlo visoko značajno je uticao ( $P < 0.001$ ) na uzrast pri izlučenju i indeks iskorišćavanja krava ( $b_{xy} = 1.386$  i  $b_{xy} = -0.020$ ), dok na ostale osobine dugovečnosti nije imao signifikantan uticaj ( $P > 0.05$ ). Uzrast krava pri prvoj oplodnji nije imao značajnog uticaja ( $P > 0.05$ ) na osobine životne proizvodnje mleka i mlečne masti.