Relationship between growth parameters of heifers at various stages of rearing and milk production in first and second lactation. A multi-farm study

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Introduction

- ✓ Preweaning ADG is known to be especially important factor affecting future milk yield of heifers, at least in the 1st lactation (Soberon et al., 2012; Gelsinger et al., 2016; Chester-Jones et al., 2017).
- ✓ It is estimated that each additional 1 kg of ADG preweaning increases milk yield in the 1st lactation from 456 to 1113 kg (Soberon et al., 2012; Chester-Jones et al., 2017).
- ✓ In some studies relationship between preweaning ADG of heifers and milk yield in the 1st lactation was linear (Soberon et al., 2012).
- ✓ Results of those studies encourage for maximizing preweaning ADG of dairy heifers.

ADG = average daily gain

Introduction

On the other hand…

- ✓ Milk yield the in the 1st lactation was not further increased when ADG of calves exceeded 800 g/day (Chester-Jones et al., 2017).
- ✓ The linear relationship between preweaning ADG of calves and future milk production can be questioned from biological point of view.
- ✓ **Some studies suggest that not only preweaning but also postweaning ADG may have substantial impact on future milk yield of cows (Bach and Ahedo, 2008; Soberon et al., 2012).**

ADG = average daily gain

Research hypotheses

1. The relationship between ADG of heifers and future milk production is not linear, at least not at all stages of rearing.

2. Future milk production is not only affected by preweaning ADG of heifers but also postweaning ADG.

3. The relationship between ADG and milk yield may differ between farms.

ADG = average daily gain

Aim of the study

The aim of the study was to determine relationships between the rearing parameters of dairy heifers (average daily gain) and the milk yield in 1st, and also 2nd lactation.

Materials and methods

Data of body weight of heifers and 1st and 2nd lactation details were received from two dairy operators:

- Operator 1: Ośrodek Hodowli Zarodowej Osięciny sp. z o.o. (Kuyavian-Pomeranian Voivodeship of Poland)
  - Records from 2765 indyvidual animals of which 1768 met all criteria
    - Records of body weight at: birth, 60 (weaning), 180, 360 and 410 days of age
- Operator 2: Top Farms Głubczyce Sp. z o. o. (Głubczyce, Opolskie Voivodeship of Poland)
  - Database 1199 indyvidual animals of which 959 met all criteria were used for further analysis.
    - Records of body weight at: birth, 30, 90, 120 and 180 days of age

Materials and methods

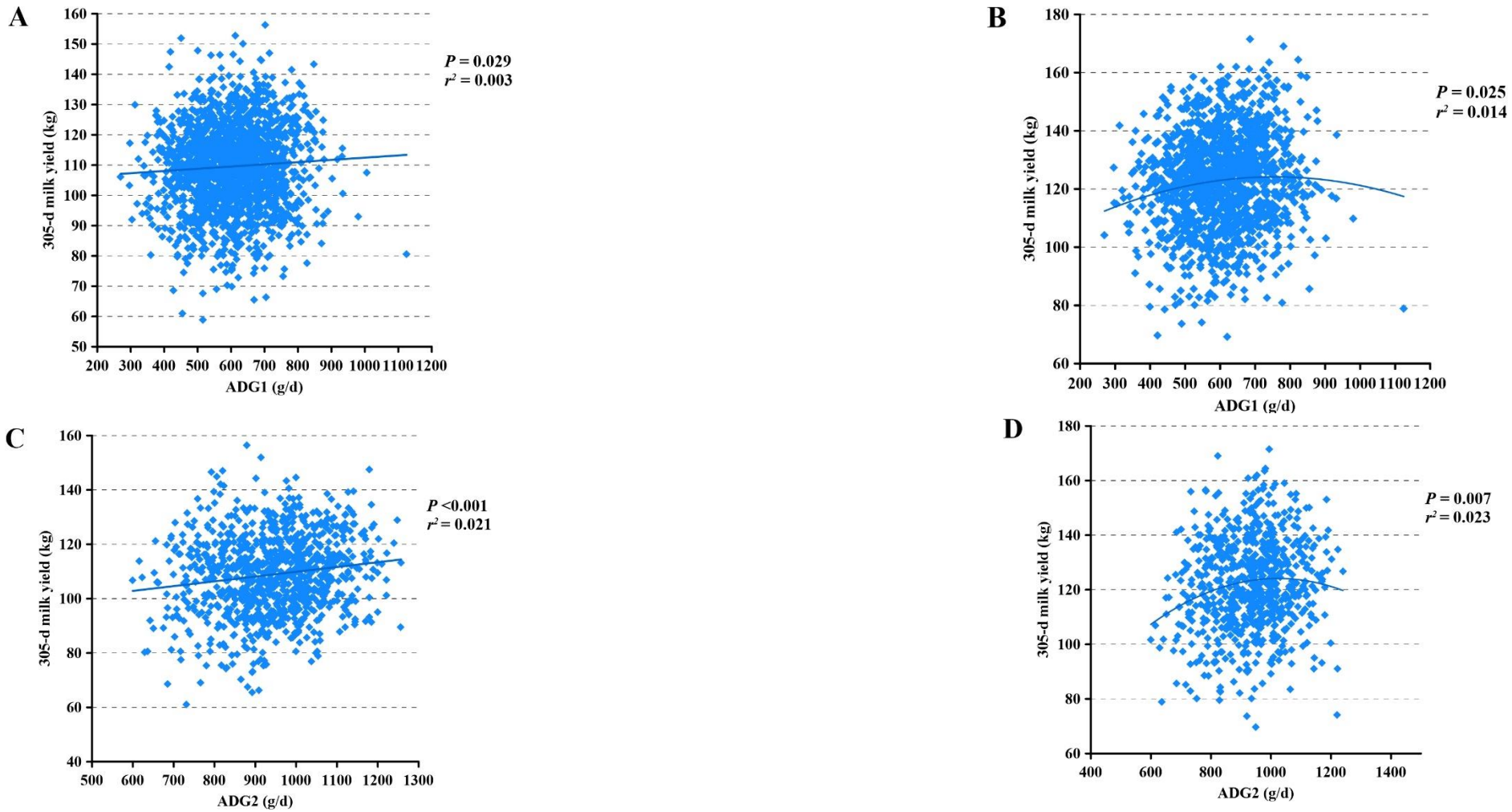
- ✓ Data processing and data analysis:
  - ✓ To estimate BW at specific life stages (day 60, 180, 360, 410 for Operator 1 and day 30, 90, 120, 180 for Operator 2) Legendre polynomials were used,
  - ✓ BWs at sepcyfic days of age were subsequently used to calculate ADG,
  - ✓ Genetic effects were removed from the dataset to focus conclusions on environmental factors,
  - ✓ Linear and quadratic regression were used to analyze the dataset.
- ✓ The SAS system (version 9.4) was used for all data analysis.

BW = body weight, ADG = average daily gain

Operator 1

1st lactation

2nd lactation



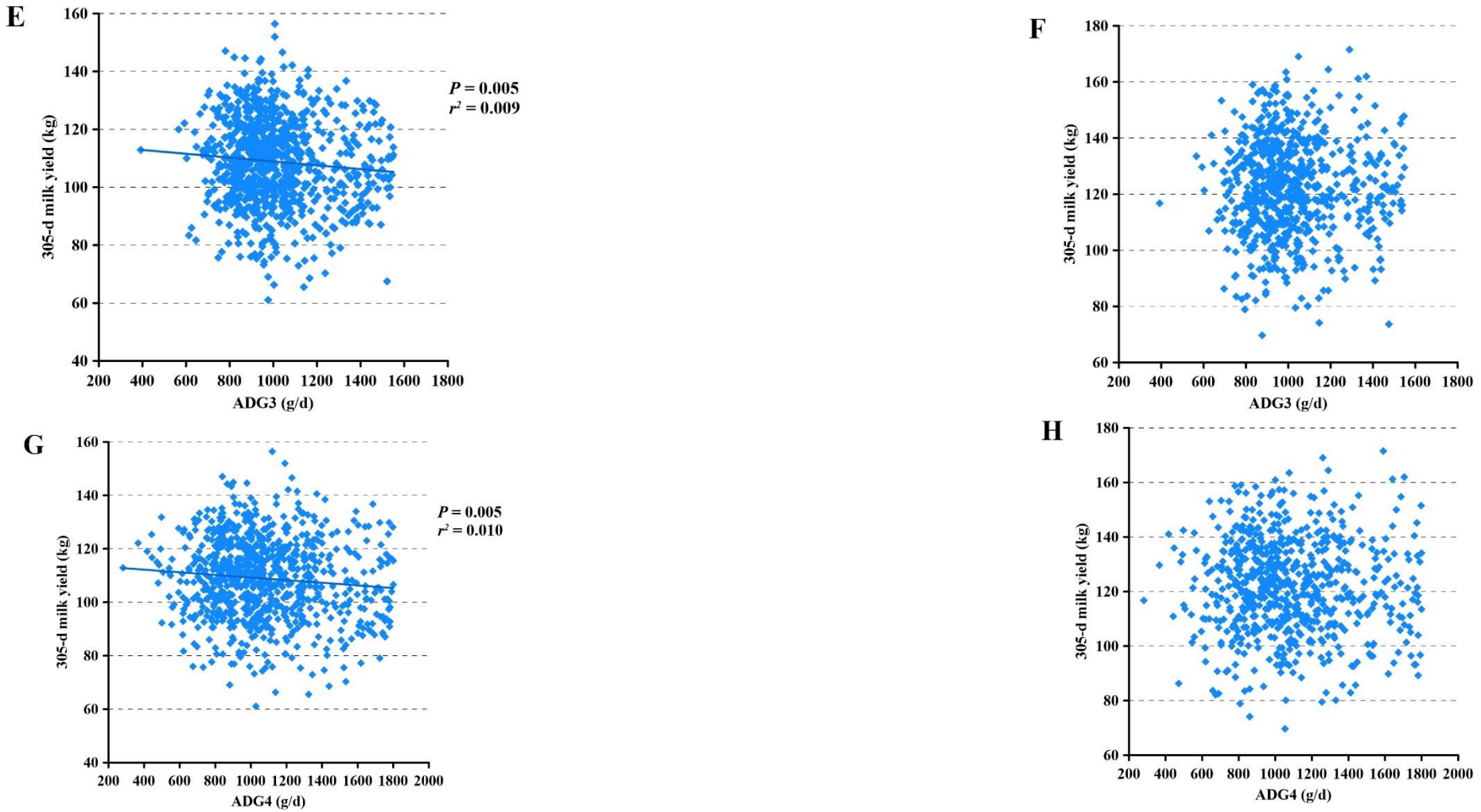
Relationship between ADG1 and 305-d milk yield in 1st (**A**) and 2nd lactation (**B**), and ADG2 and 305-d milk yield in 1st (**C**) and 2nd lactation (**D**)

ADG1 = average daily gain between birth and 60 day of age, ADG2 - average daily gain between 60 day of age and 180 days of age *P* = *P*-value for linear or quadratic regression

Operator 1

1st lactation

2nd lactation

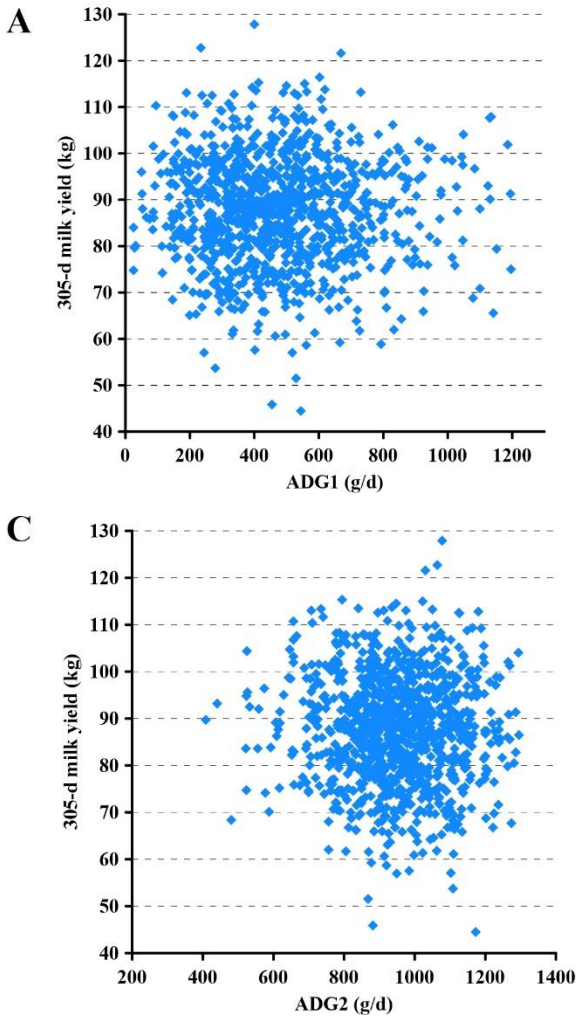


Relationship between ADG3 and 305-d milk yield in 1st (**E**) and in 2nd lactation (**F**), and ADG4 and 305-d milk yield in 1st (**G**) and in 2nd lactation (**H**)

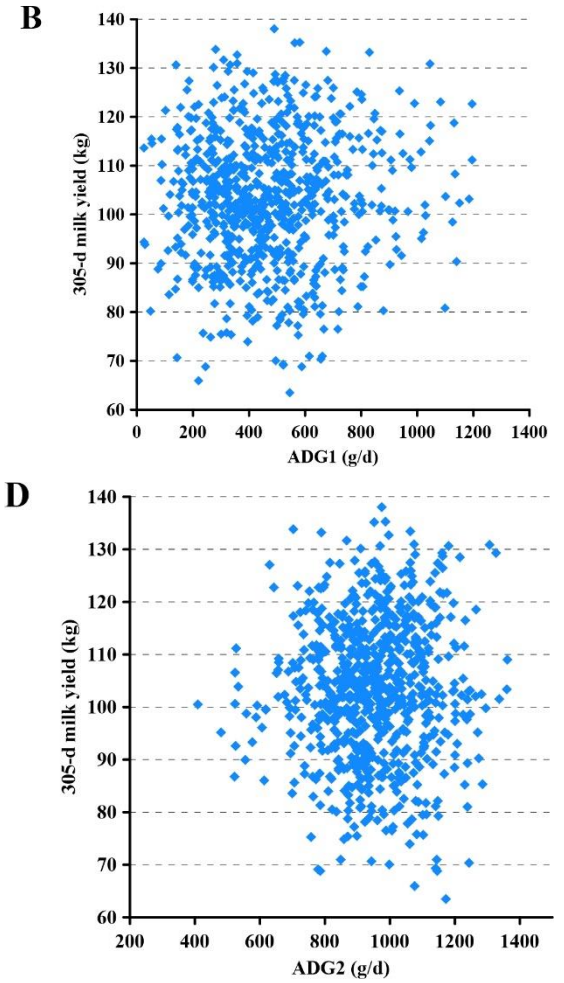
ADG3 = average daily gain between 180 and 360 days of age, ADG4 - average daily gain between 360 and 410 days of age *P* = *P*-value for linear or quadratic regression

Operator 2

1st lactation



2nd lactation



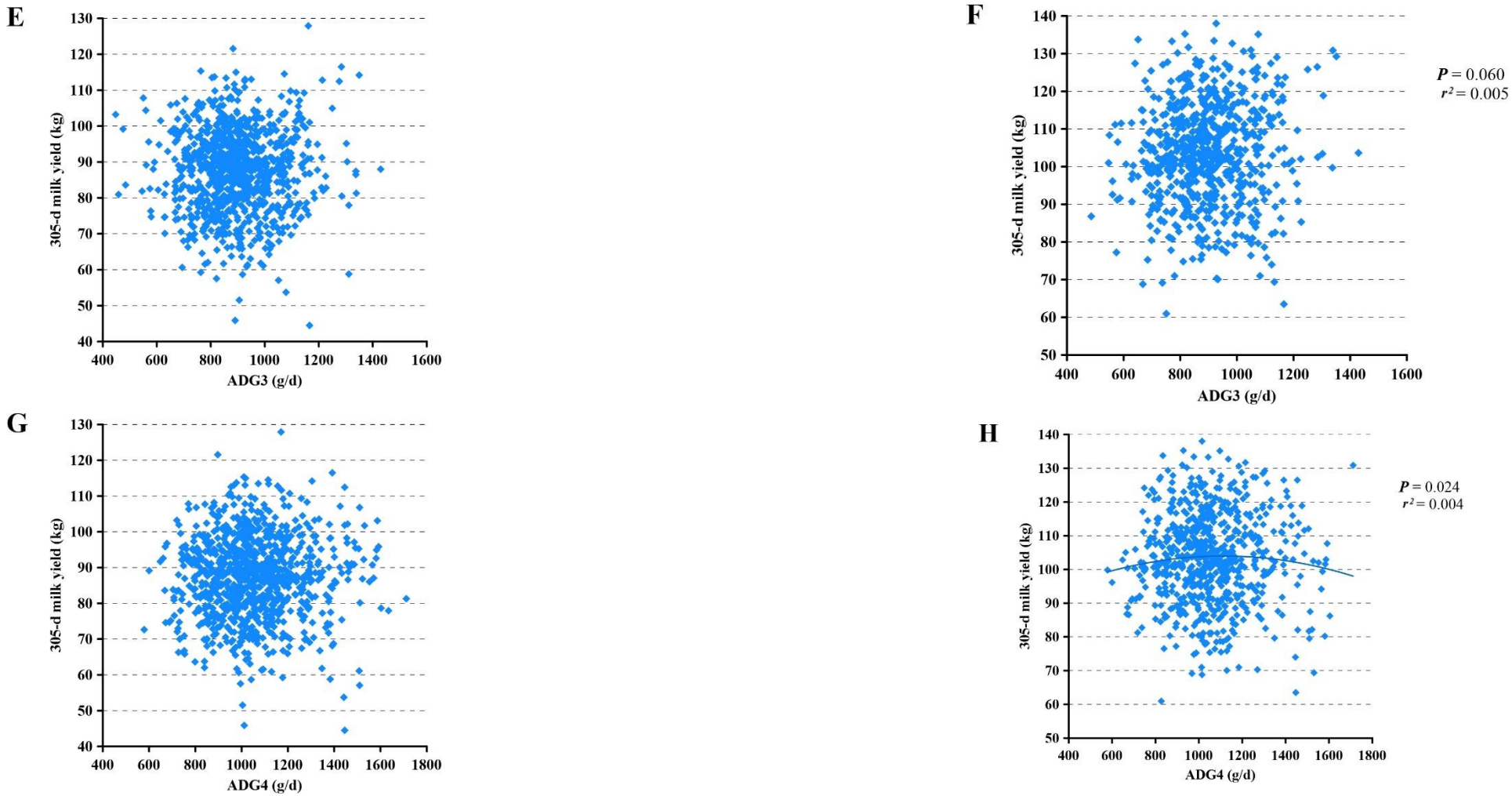
Relationship between ADG1 and 305-d milk yield in 1st (**A**) and 2nd lactation (**B**), and ADG2 and 305-d milk yield in 1st (**C**) and 2nd lactation (**D**)

ADG1 = average daily gain between birth and 30 day of age, ADG2 - average daily gain between 30 day of age and 90 days of age *P* = *P*-value for linear or quadratic regression

Operator 2

1st lactation

2nd lactation



Relationship between ADG3 and 305-d milk yield in 1st (**E**) and in 2nd lactation (**F**), and ADG4 and 305-d milk yield in 1st (**G**) and in 2nd lactation (**H**)

ADG3 = average daily gain between 90 and 120 days of age, ADG4 - average daily gain between 120 and 180 days of age *P* = *P*-value for linear or quadratic regression

Conclusions

- ✓ The milk yield of heifers can be affected by ADG during both the preweaning and postweaning phases of rearing.
- ✓ The relationship between ADG and future milk yield varies depending on the stage of rearing and farm.
- ✓ The relationship between ADG and future milk yield can be either linear or quadratic and both positive and negative.
- ✓ The relationship between ADG and future milk yeild may differ for 1st and 2nd lactation.
- ✓ Based on analyzed data set it is difficult to propose strict recommendations in terms of ADG of rearing heifers for producers.

ADG = average daily gain

THANK YOU

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