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STARCH, PROTEIN AND LIPID CONTENT OF CERTAIN MAIZE HYBRIDS CULTIVATED IN DIFFERENT PEDOCLIMATE AREAS OF ROMANIA IN THE PERIOD 2018-2019

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Abstract

This paper aims to bring to the fore new data on the content of starch, protein and lipids in corn grains from 24 hybrids from different maturity groups, grown in period 2018-2019 in ten areas of our country, in different pedoclimatic conditions. The highest average obtained regarding the starch content in the two years of study (2018-2019) was 68,865% for the P9241 hybrid, and the lowest 66.315%% for the LG30315 hybrid, resulting in a variability of 2.55%. Although the maize hybrid EVO3617, obtained the highest average protein content in the two years of study, in terms of lipids, obtained the lowest content (3,920%). During the study period, it was found that tardy hybrids have grains with a higher protein content *compared early hybrids. To the 24 corn hybrids studied in the two years, the lipid content showed a variability of 0.475%, being the lowest compared to the variability of the starch and protein content.*

Key words*: corn, grain, starch, protein, lipids.*

INTRODUCTION

Romania has a very important role on the corn market considering the significant quantities it produces, being in full growth in terms of production and exports, reaching in 2017 the largest corn producer in the EU, with an estimated production of 13 million tons (Popescu et al., 2018).

Research on agricultural production in Romania reflects a continuing concern for ensuring the internal and external market of Romanian agricultural products (Toth and Cristea, 2018; Alexandru et al., 2018; Țeican et al., 2019; Chiriac et al., 2018; Arghiroiu and colab, 2018).

Over the the time, corn has proven to be a valuable plant both in terms of productivity and in terms of its economic importance, due to its multiple uses in human nutrition, in animal feeding and in industry.

This plant ranks third in importance among plants grown on Earth. This position is acquired through a series of peculiarities: it has a high production capacity, it has a great ecological plasticity, which allows a wide spreading area, it is a good precursor plant for most crops, it supports monoculture, it can be cultivated 100% mechanized, harvesting is done without shaking, capitalizes well on fertilizers and water (Chilba et al., 2019).

Over 50% of human caloric needs are provided by cereal products, their chemical composition establishing the specificity and value of each.

Corn grains are used in industry to obtain alcohol, starch, dextrin, glucose and other products (plastics, glue, acetone, dyes, etc.), and a good quality dietary oil is extracted from embryos to prevent the accumulation of cholesterol in the blood (Muntean et al., 2008).

In the case of corn, the chemical composition of the grains is very varied and can be influenced by: the pedoclimatic conditions, variety, variety and agrotechnics used, but it is similar to that of other cereals from a structural point of view.

The endosperm occupies the main part of the bean (80-84%), composed of cells with starch and protein storage tissue. The general appearance of the endosperm is presented in two variants: a corneous part and a floury one, predominating one or the other, depending on the variety.

Carbohydrates in corn represent about 80% of the grain, of which starch has the largest share. In addition to starch, there are 3% sugars and dextrins, 6% pentosans, 3% cellulose.

Proteins present between 9 and 13.5% (with variation limit between 8-14%), being

represented in a proportion of approx. 45% prolamine (zein), approx. 35% glutenin and approx. 20% globulin.
Zein is the main protein in corn kernels, which has a high content of glutamic acid and leucine, but a very low content of tryptophan and almost devoid of lysine. Over 73% of proteins are located in the endosperm (Ion, 2010).

MATERIALS AND METHODS

Our research aimed to at analyzing the chemical composition of corn on starch, protein and lipids in the 24 corn hybrids studied in 2018-2019, hybrids grown in different pedoclimatic zones of Romania (Figure 1).
The experiences were placed in ten locations, according to the randomized blocks method in 3 repetitions at a density of 70,000 plants / ha.
Harvesting was done manually, taking samples to determine: production, grain moisture at harvest, table of 1000 grains, hectoliter table and chemical composition (starch, protein, lipids, ash).

Figure 1. The locations where the research was conducted. Source: www.istis.ro

The determination of the protein, lipids and starch content was performed with the help of the INFRA NEO JUNIOR automatic analyzer having as operating principle the infrared scanning of the seeds of which the sample is constituted.
This paper is based on own data obtained through laboratory analysis and interpretation of data related to the study of corn hybrids in period 2018-2019.

RESULTS AND DISCUSSIONS

In the period 2018-2019, a number of 24 hybrids from different precocity groups were studied, cultivated in 10 areas of our country, in different pedoclimatic conditions.
During the cultivation of the studied hybrids, it was used as a precursor plant (peas), the plants were fertilized with ammonium nitrate at a dose of 200 kg / ha and and a unitary agrotechnics was used.
Similar research was carried out in the period 2003-2005 for a number of 21 maize hybrids from different maturity groups (FAO 300-400, FAO 200-300 and FAO 100-200), obtaining in the studied period an average of 69 % starch content, 4% protein and 12.4% lipids (Haș and colab., 2010).
Also, research on the variability of the chemical composition of grains in certain maize hybrids was performed and in the period 2009-2013, obtaining the following values: starch 69%, fat 5.2% and protein 11.3% (Haș and colab., 2019).
For 2018, the starch content varied between 65.9 and 69.4% for the 24 hybrids studied as shown in Table 1
The highest content was registered for the INVENTIVE hybrid with a starch percentage of 69.4% in the location in Cogealac, Constanta county, closely followed by the hybrid P9241 with a 69.3% starch percentage for the same location, Cogealac in Constanța county, but also by SY ORPHEUS hybrid with a starch percentage of 69.1% (Inand locality).
The EVO 3517 hybrid stood out with the lowest starch content, with 65.9% in the location from Dalga, Calarasi county.
Analyzing the averages obtained on the 10 locations where the experiences were located, the highest starch content was obtained by the hybrid P9241 (69.03%), and the lowest was recorded at the hybrid EVO 3517 (66.71%).
In 2019, the corn hybrid P9241 was noticed, registering the highest starch content, of 69.1% in the location from Cogealac, Constanta county, and at the opposite pole, the lowest starch content was registered by the hybrid EVO 3517, of 64.8% , in the location from Portaresti.
Analyzing the averages obtained on the 10 locations where the experimences were located, the lowest starch content was recorded by the hybrid EVO 3517, of 65.92%, and the highest percentage of starch, of 68.70%, the hybrid P9241.

Table 1. Starch content of analyzed hybrids, 2018-2019 (%)

Hybrid	Year	Starch (%)										Average
		Cogealac	Dâlga	Inand	Portărești	Peciu Nou	Mircea Vodă	Dej	Sibiu	Negrești	Simleul Silvaniei	
EVO 3517	2018	66.9	65.9↓	67.0	67.2	66.7	66.9	67.0	66.3	66.5	66.7	**66.71**
	2019	66.5	65.7	66.2	64.8↓	65.3	66.1	66.4	65.8	66.1	66.3	**65.92**
LG30315	2018	68.4	67.9	68.1	68.8	67.9	68.5	68.1	68.3	68.6	68.1	**68.27**
	2019	68.1	67.3	67.2	68.0	67.9	68.4	67.6	68.3	68.4	67.9	**67.91**
P9241	2018	69.3	68.7	69.2	69.1	69.0	69.2	69.0	69.2	68.7	68.9	**69.03**
	2019	69.1↑	68.3	68.0	68.4	69.0	68.7	69.0	69.2	68.7	68.6	**68.70**
INVENTIV E	2018	69.4↑	68.9	68.2	68.5	68.9	69.1	68.3	68.5	68.2	67.7	**68.57**
	2019	68.4	68.0	67.9	68.3	68.5	68.3	67.7	67.7	68.0	67.5	**68.03**
SY ORPHEUS	2018	68.9	68.5	69.1	68.5	68.2	67.2	68.3	67.8	68.1	68.3	**68.29**
	2019	68.5	67.8	68.3	67.9	67.4	68.2	68.4	67.6	67.8	68.0	**67.99**
TURDA 201	2018	67.9	68.0	68.2	67.9	67.6	68.0	67.2	67.9	67.6	68.1	**67.84**
	2019	67.8	68.0	68.2	67.8	68.1	68.3	67.9	67.7	67.6	67.8	**67.92**
FARADAI	2018	68.7	68.3	68.1	68.0	67.8	67.9	67.7	68.1	68.6	68.3	**68.15**
	2019	67.3	68.0	67.6	68.3	68.1	67.5	67.7	67.9	68.0	67.7	**67.81**
LG30369	2018	68.9	68.4	68.0	67.9	68.0	67.6	68.0	67.6	68.1	67.7	**68.02**
	2019	68.9	68.5	68.2	68.3	68.7	68.5	68.3	67.9	68.2	68.1	**68.36**
P9903	2018	67.9	68.1	68.2	67.6	67.5	67.9	67.5	67.6	67.9	68.0	**67.82**
	2019	68.5	68.2	68.4	68.3	68.6	67.6	67.7	68.2	68.4	68.2	**68.21**
EVO 3617	2018	68.7	68.5	67.8	67.7	67.8	67.2	67.9	67.5	68.2	67.6	**67.89**
	2019	68.6	68.9	68.5	68.3	68.5	68.6	68.2	67.9	68.2	67.9	**68.36**
OLT	2018	68.2	67.8	67.3	67.5	67.6	68.1	67.7	67.5	68.5	67.6	**67.78**
	2019	67.8	68.0	67.9	67.8	68.2	68.1	67.8	67.7	68.2	67.8	**67.93**
SENSOR	2018	67.8	68.0	68.0	67.8	67.6	67.7	67.9	67.5	68.5	67.4	**67.82**
	2019	68.2	67.9	68.3	67.7	67.9	68.0	67.9	67.7	68.1	67.3	**67.90**
LG 30389	2018	67.9	68.3	67.9	67.7	68.2	68.5	68.0	67.8	68.8	67.9	**68.10**
	2019	68.1	68.0	67.9	67.9	68.0	67.6	67.9	68.2	68.0	67.7	**67.93**
P9911	2018	68.3	67.8	67.7	67.8	68.0	68.6	67.5	67.3	68.3	68.0	**67.93**
	2019	67.9	68.1	68.0	67.9	68.1	68.2	67.9	68.1	68.0	67.9	**68.01**
ZEPHYR	2018	67.9	68.5	67.6	67.5	67.8	68.7	67.3	67.4	68.7	68.5	**67.99**
	2019	67.5	68.1	67.8	68.0	68.1	67.6	67.8	68.0	68.1	67.9	**67.89**
FUNDULEA 376	2018	67.9	67.8	67.5	67.9	67.6	68.1	67.9	67.5	68.0	67.9	**67.81**
	2019	67.9	68.0	67.7	67.8	68.0	68.1	67.8	67.8	68.1	67.8	**67.90**
LAGOON	2018	68.0	68.2	67.8	67.9	68.0	68.7	67.9	67.7	68.3	68.2	**68.07**
	2019	67.6	68.0	67.8	67.7	67.9	68.1	68.0	67.8	68.1	67.7	**67.87**
P 0412	2018	68.1	68.2	67.9	68.1	67.5	68.7	67.9	67.9	68.3	68.0	**68.06**
	2019	68.1	67.8	67.9	68.1	68.1	67.8	68.0	67.9	68.1	67.9	**67.97**
LG 31377	2018	68.2	68.0	67.7	67.9	67.5	68.0	67.7	67.8	68.5	67.9	**67.92**
	2019	67.9	68.0	67.7	67.9	68.0	68.3	67.8	68.1	68.1	67.7	**67.95**
DKC 5830	2018	68.3	68.0	67.7	67.5	68.0	68.0	67.6	67.9	68.1	68.0	**67.91**
	2019	67.9	68.3	68.3	67.7	67.9	68.2	67.8	67.9	68.3	68.0	**68.03**
P 0725	2018	68.0	68.4	67.8	67.6	68.0	68.2	67.9	67.8	68.4	68.0	**68.01**
	2019	68.1	67.9	68.0	67.8	68.2	68.3	67.7	67.8	68.0	67.9	**67.97**
LG 30500	2018	68.3	68.2	67.9	67.6	67.5	68.2	67.9	67.5	68.3	67.9	**67.93**
	2019	67.9	68.2	67.9	68.0	68.1	67.7	67.8	68.1	68.0	67.7	**67.94**
ZLATAN	2018	68.2	68.2	67.9	67.9	68.0	68.4	67.9	67.6	68.1	67.9	**68.01**
	2019	67.9	67.9	68.1	68.2	68.2	68.0	68.1	67.9	68.0	68.2	**68.05**
TOMASOV	2018	68.4	68.2	67.8	67.9	67.8	67.9	67.9	67.8	68.4	67.9	**68.00**
	2019	67.9	67.8	68.0	68.1	67.8	68.0	67.8	67.9	68.1	67.9	**67.93**

TURDA 201 and EVO 3617 hybrids obtained the highest protein content, respectively 11.23% in the locations in Cogealac and Mircea Voda, followed by the hybrid LG30369 with 11.21% in the location in Cogealac, while the lowest percentage, respectively 9.91%, at obtained the hybrid LG30315, in the location from Dej, Cluj county.

From the point of view of the average on the ten locations where the experiences were located,

the highest protein content was obtained by the hybrid EVO 3617 (11,165%), and the lowest percentage was registered by the hybrid LG30315 (10,110%), as shown in Table 2.

Table 2. Protein content of analyzed hybrids, 2018-2019 (%)

Hybrid	Year	Protein (%)										Average
		Cogealac	Dâlga	Inand	Portăreşti	Peciu Nou	Mircea Vodă	Dej	Sibiu	Negreşti	Simleul Silvaniei	
EVO 3517	2018	10.35	10.30	10.30	10.23	10.28	10.31	10.30	10.29	10.32	10.24	**10.292**
	2019	10.28	10.31	10.30	10.12	10.28	10.26	10.29	10.24	10.31	10.19	**10.258**
LG30315	2018	10.21	10.14	10.20	10.00	10.10	10.00	9.91^{+}	10.15	10.21	10.18	**10.110**
	2019	10.10	10.07	10.12	9.85^{+}	10.00	9.96	9.87	10.05	10.10	10.12	**10.024**
P9241	2018	10.81	10.70	10.83	10.75	10.82	10.83	10.81	10.88	10.93	10.82	**10.818**
	2019	10.76	10.69	10.81	10.72	10.79	10.83	10.80	10.86	10.89	10.82	**10.797**
INVENTIVE	2018	11.07	11.10	10.96	11.08	11.02	10.96	10.99	11.12	11.10	10.94	**11.034**
	2019	11.07	10.95	10.98	11.01	11.02	10.95	10.99	11.06	11.10	10.96	**11.009**
SY ORPHEUS	2018	11.10	11.00	10.77	10.95	10.99	11.09	10.94	11.09	11.01	10.99	**10.993**
	2019	11.02	11.00	10.87	10.90	10.85	11.00	10.91	11.03	10.94	10.98	**10.950**
TURDA 201	2018	11.23^{+}	11.15	11.10	11.12	11.10	11.00	11.02	11.12	11.15	11.10	**11.109**
	2019	11.21	11.12	11.08	10.99	11.18	10.98	10.99	11.12	11.10	11.10	**11.087**
FARADAI	2018	10.91	10.99	10.96	10.92	10.90	10.99	10.97	11.00	10.87	10.89	**10.940**
	2019	10.82	10.95	10.92	11.00	10.87	10.99	10.99	11.01	10.86	10.89	**10.930**
LG30369	2018	11.21	11.12	11.10	11.01	11.10	11.00	11.19	11.12	11.04	10.99	**11.088**
	2019	11.24^{+}	11.03	11.01	11.01	11.12	10.95	11.21	11.08	11.15	10.98	**11.078**
P9903	2018	11.19	11.17	11.00	11.08	11.11	11.18	11.07	11.12	11.14	11.11	**11.117**
	2019	11.12	11.08	11.00	11.12	11.15	11.09	11.12	11.06	11.16	11.14	**11.104**
EVO 3617	2018	11.20	11.00	11.14	11.21	11.16	11.23^{+}	11.08	11.22	11.21	11.20	**11.165**
	2019	11.24^{+}	10.99	11.12	11.20	11.08	11.21	11.10	11.27	11.20	11.21	**11.162**
OLT	2018	11.10	11.06	11.12	10.98	11.09	10.96	11.02	11.13	11.00	10.99	**11.045**
	2019	11.02	10.90	10.98	11.06	11.09	10.98	11.02	11.06	11.00	10.97	**11.008**
SENSOR	2018	10.89	10.93	10.89	11.00	11.09	10.92	10.92	10.90	10.89	10.95	**10.938**
	2019	10.87	10.91	10.89	10.93	10.95	10.90	10.92	10.99	10.88	10.89	**10.913**
LG 30389	2018	11.02	10.98	11.10	11.04	10.99	10.95	10.98	11.00	10.85	10.99	**10.990**
	2019	11.00	10.91	10.86	11.02	10.90	10.95	10.88	11.01	10.89	10.97	**10.939**
P9911	2018	11.08	10.94	10.98	10.92	11.09	10.87	11.10	11.06	10.97	10.99	**11.000**
	2019	10.95	11.00	10.99	11.00	11.01	11.10	11.04	10.89	11.04	10.95	**10.997**
ZEPHYR	2018	11.00	10.98	11.10	11.06	11.00	10.99	11.10	11.12	11.01	10.98	**11.034**
	2019	11.12	10.87	11.22	11.10	10.95	10.96	11.09	10.87	11.05	11.00	**11.030**
FUNDULEA 376	2018	11.07	10.99	11.12	11.00	11.10	11.02	11.12	11.06	10.98	10.97	**11.043**
	2019	10.92	11.00	10.91	11.10	11.00	10.97	11.10	11.08	11.00	11.01	**11.090**
LAGOON	2018	11.05	11.00	10.99	11.00	11.09	10.90	11.09	11.11	11.05	10.99	**11.027**
	2019	11.03	10.97	11.02	11.12	11.15	10.99	11.10	11.10	11.00	11.03	**11.051**
P 0412	2018	11.08	10.99	10.90	11.06	11.11	10.90	11.09	11.12	11.09	10.89	**11.023**
	2019	11.02	10.95	11.02	11.09	11.10	10.97	10.89	11.00	10.99	11.00	**11.003**
LG 31377	2018	11.08	10.90	10.99	11.12	11.15	10.98	11.06	11.10	11.00	10.95	**11.033**
	2019	11.12	11.02	11.05	11.06	11.10	11.11	11.09	11.10	11.03	11.05	**11.073**
DKC 5830	2018	11.10	10.90	11.08	11.06	11.09	10.90	10.92	11.06	11.09	10.91	**11.011**
	2019	11.10	10.78	10.81	11.09	11.00	10.92	11.01	11.06	10.98	10.87	**10.962**
P 0725	2018	11.10	10.98	10.98	11.12	11.09	10.87	11.11	11.06	11.01	10.97	**11.029**
	2019	11.08	11.07	11.00	11.12	11.18	10.98	11.02	11.06	11.00	10.97	**11.048**
LG 30500	2018	11.09	10.91	10.98	11.12	11.16	10.98	11.05	11.10	11.00	10.98	**11.037**
	2019	11.10	11.03	11.05	10.95	11.00	10.96	11.15	11.10	11.07	10.99	**11.040**
ZLATAN	2018	11.10	10.93	10.98	11.12	10.91	10.98	11.02	11.10	10.93	10.99	**11.006**
	2019	11.08	11.03	11.10	11.12	11.18	11.02	11.00	11.13	11.00	10.99	**11.065**
TOMASOV	2018	11.09	10.90	11.12	11.06	11.10	10.98	11.00	11.13	11.09	10.99	**11.046**
	2019	11.12	11.10	11.15	11.09	11.16	11.08	11.12	11.14	11.11	11.18	**11.125**

In 2019, the hybrids LG30369 and EVO 3617, respectively 11.24%, both located in Cogealac, obtained the highest protein content, and the lowest percentage of protein, respectively 9.85%, was obtained by the hybrid LG30315, located in Portaresti .

From the point of view of the average on the ten locations where the experiences were located, the highest protein content was obtained by the hybrid EVO 3617 (11,162%), and the lowest percentage was registered by the whole hybrid LG30315 (10,024%).
From the point of view of the average on the ten locations where the experiences were located, the highest protein content was obtained by the hybrid EVO 3617 (11,162%), and the lowest percentage was registered by hybrid LG30315 (10,024%).
The highest lipid content was registered in 2018, respectively 4.6% for the SY ORPHEUS hybrid in the location in Cogealac and the SENSOR hybrid in two locations out of the ten, respectively Dalga and Mircea Voda. The lowest lipid content was registered for EVO 3517 and ZEPHYR hybrids, respectively 3.7% in the locations from Negresti and Simleul Silvaniei, as shown in Table 3.
From the point of view of the average on the ten locations where the experiences were located, the highest lipid content was registered in 2018 for the hybrid P9241 (4.27%), and the lowest was registered for the hybrid EVO 3617 (3.94%).
In 2019, with the highest lipid content was the SENSOR hybrid, with a percentage of 4.6% in the location in Mircea Voda, and the lowest lipid content was registered in the SY ORPHEUS hybrid, respectively 3.6% in the location in Negresti.
From the point of view of the average on the ten locations where the experiences were located, the highest lipid content registered at the SENSOR hybrid (4.37%), and the lowest was registered for the EVO 3617 hybrid (3.90%)

Table 3. Lipid content of analyzed hybrids, 2018-2019 (%)

Hybrid	Year	Lipid (%)										Average
		Cogealac	Dâlga	Inand	Portărești	Peciu Nou	Mircea Vodă	Dej	Sibiu	Negrești	Simleul Silvaniei	
EVO 3517	2018	4.3	4.1	3.9	4.1	4.3	4.3	4.1	4.2	4.5	4.4	**4.22**
	2019	4.2	4.0	3.7	4.1	4.3	4.0	3.9	4.2	4.3	4.0	**4.07**
LG30315	2018	3.9	4.1	3.9	4.0	4.2	4.1	3.9	4.3	4.2	4.2	**4.08**
	2019	3.7	3.9	3.7	4.0	4.1	3.8	3.9	4.3	4.1	4.3	**3.98**
P9241	2018	4.4	4.2	4.1	4.3	4.2	4.2	4.3	4.4	4.2	4.4	**4.27**
	2019	4.3	4.1	4.1	4.4	4.2	4.1	4.3	4.1	4.2	4.2	**4.20**
INVENTIVE	2018	4.3	4.1	4.4	4.2	4.3	4.0	4.1	4.0	4.2	4.2	**4.18**
	2019	4.0	4.2	4.2	4.4	4.3	4.0	4.3	4.0	3.9	4.1	**4.14**
SY ORPHEUS	2018	4.6↑	4.2	3.9	4.0	4.1	4.5	4.0	4.2	4.5	4.2	**4.22**
	2019	4.4	4.2	3.8	4.1	3.7	4.2	4.3	4.0	3.6↓	3.9	**4.02**
TURDA 201	2018	4.4	4.2	4.0	4.0	4.2	4.1	4.3	4.0	4.0	4.1	**4.13**
	2019	4.3	4.2	4.1	4.0	4.3	4.2	4.3	4.1	4.2	4.1	**4.18**
FARADAI	2018	3.9	4.1	4.2	3.9	4.2	4.1	4.0	3.8	3.9	4.1	**4.02**
	2019	3.9	4.2	4.0	3.8	4.3	4.0	4.2	4.1	3.9	4.3	**4.07**
LG30369	2018	3.8	4.0	3.9	4.1	4.2	4.0	3.8	4.0	3.8	3.9	**3.95**
	2019	3.8	4.0	4.3	4.1	4.3	4.0	3.9	4.0	3.8	4.0	**4.02**
P9903	2018	4.0	4.1	3.8	3.8	4.1	4.0	4.2	3.9	4.1	4.0	**4.00**
	2019	3.9	4.2	4.0	3.8	4.2	4.0	4.4	3.9	3.9	4.0	**4.03**
EVO 3617	2018	3.8	4.0	3.9	3.9	4.0	4.1	4.0	3.9	3.7↓	4.1	**3.94**
	2019	3.7	4.0	3.9	3.8	4.1	3.9	4.0	3.7	3.9	4.0	**3.90**
OLT	2018	4.0	4.2	4.2	4.3	4.1	3.9	4.1	4.1	3.9	3.8	**4.06**
	2019	4.2	4.3	4.2	4.3	4.3	4.1	4.3	4.1	3.9	4.0	**4.17**
SENSOR	2018	4.4	4.6↑	4.4	4.3	4.3	4.6↑	4.5	4.3	4.3	4.5	**4.42**
	2019	4.5	4.3	4.2	4.5	4.3	4.6↑	4.4	4.2	4.3	4.4	**4.37**
LG 30389	2018	4.0	4.4	4.1	4.0	3.9	4.0	3.8	4.1	3.9	4.1	**4.03**
	2019	4.1	4.3	4.0	3.8	3.9	4.0	4.2	4.1	3.8	3.9	**4.01**
P9911	2018	4.0	4.3	4.1	4.3	4.2	3.9	4.2	4.1	4.0	4.1	**4.12**
	2019	3.9	4.1	4.0	3.9	4.2	4.0	4.1	3.8	4.1	4.0	**4.01**
ZEPHYR	2018	4.2	4.1	3.9	4.3	4.2	3.8	4.3	4.2	3.9	3.7↓	**4.06**
	2019	3.9	4.2	4.0	4.1	3.8	4.0	4.1	4.1	3.9	4.1	**4.02**
FUNDULEA 376	2018	4.0	4.3	4.1	3.9	4.1	4.1	3.8	4.0	4.2	4.3	**4.08**
	2019	4.4	4.2	4.1	4.3	4.2	4.3	4.2	4.0	4.1	4.0	**4.18**

LAGOON	2018	3.9	4.1	4.2	4.0	3.8	4.0	3.9	4.1	4.2	4.0	**4.02**
	2019	3.9	4.3	4.0	3.8	3.8	4.2	3.8	4.1	3.9	4.1	**3.99**
P 0412	2018	4.0	4.3	4.2	3.9	4.0	4.1	3.9	3.8	3.9	4.2	**4.03**
	2019	4.1	4.2	4.1	4.1	4.3	4.0	4.3	3.9	4.0	4.1	**4.11**
LG 31377	2018	3.8	4.4	4.3	3.9	4.0	4.1	4.0	3.9	3.9	4.2	**4.05**
	2019	4.0	4.1	4.2	4.1	4.0	3.9	4.0	3.8	3.9	3.8	**3.98**
DKC 5830	2018	3.9	4.3	4.0	4.1	4.0	4.4	4.3	4.0	4.2	4.1	**4.13**
	2019	4.0	3.8	4.1	4.0	3.9	3.9	4.0	4.0	4.2	4.1	**4.00**
P 0725	2018	3.9	4.3	4.2	4.0	4.0	4.3	4.0	3.8	3.9	4.1	**4.05**
	2019	3.7	4.0	4.1	4.0	3.8	4.2	4.0	4.1	4.2	4.3	**4.04**
LG 30500	2018	3.8	4.3	4.2	3.9	4.0	4.1	3.9	4.0	3.9	4.1	**4.02**
	2019	4.0	3.9	4.1	4.3	4.2	4.3	4.0	3.9	4.1	4.3	**4.11**
ZLATAN	2018	3.9	4.3	4.2	3.8	4.3	4.0	3.9	4.1	4.0	4.2	**4.07**
	2019	3.8	4.0	3.8	3.9	3.9	4.1	4.0	3.9	4.1	4.2	**3.97**
TOMASOV	2018	3.9	4.3	4.0	4.1	4.0	4.4	4.1	4.1	3.8	4.2	**4.09**
	2019	4.3	4.2	4.0	4.1	4.2	4.1	4.2	4.0	4.1	4.0	**4.12**

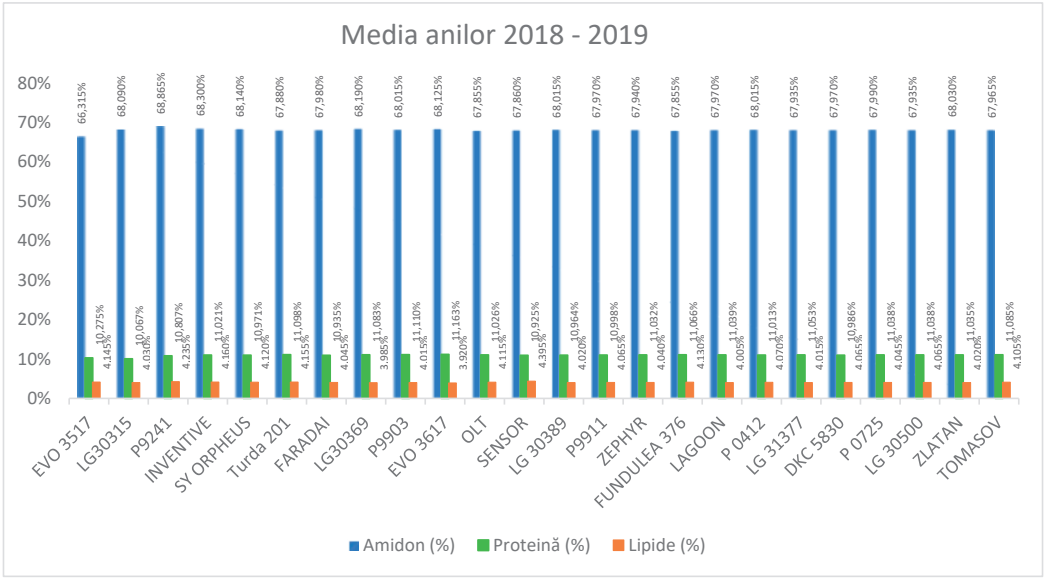

Figure 2. Average of the two years of study regarding the content of starch, protein and lipids in the studied maize hybrids

The highest average regarding the starch content in the studied hybrids, in the period 2018-2019, was registered at the hybrid P9241, respectively 68,865%, followed by the hybrid INVENTIVE with 68.3% and the hybrid LG30369 with 68.19%, and the lowest average of was registered to the hybrid EVO3517, respectively 66.315%.

In terms of protein content, the EVO 3617 hybrid stood out, recording the highest average of the two years of study, respectively 11,163%, followed by a difference of 0.053% by the hybrid P9903, and the lowest average for the two years of study. was obtained by the hybrid LG30315, of 10,067%.

The highest average lipid content in the two years of study was 4,395%, obtained by the SENSOR hybrid, followed by the INVENTIVE hybrid (4,160%) and the TURDA 201 hybrid (4,155%), and the lowest average lipid content in the two years of study it was 3,920% related to the hybrid EVO 3617 (Figure 2).

CONCLUSIONS

The highest average obtained starch content in the two years of study (2018-2019) was 68,865% for the P9241 hybrid, and the lowest 66.315%% for the LG30315 hybrid, resulting in a variability of 2.55%.

Analyzing the average on the ten locations where the experiences were located, it was found that the hybrid EVO 3617 obtained in the two years of study, the highest protein content, respectively 11,163% (11.23% in 2018 and 11.24% in 2019), and the lowest average was obtained by the hybrid LG30315, respectively 10,067, the variability being 1,096%.
Although the maize hybrid EVO3617 obtained the highest average protein content in the two years of knowledge, it obtained the lowest average lipid content (3,920%).
To the 24 corn hybrids studied in the two years, the lipid content showed a variability of 0.475%, being the lowest compared to the variability of starch and protein content.

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