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Yield, physiological and biochemical parameters of *Ocimum basilicum* L. under foliar ecological fertilization



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GLOBAL

- 160 countries, organic farming (FIBL-IFOAM)

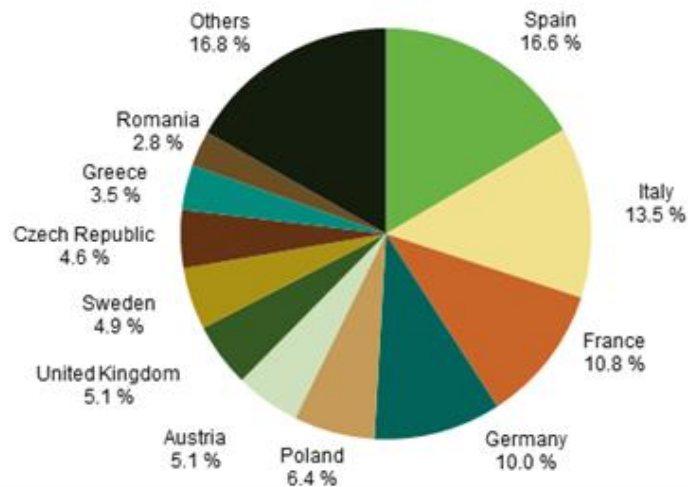
- 2010, An area of 37 million hectares
(11.30% Austria, 9.70% Switzerland, 7.94% Italy,
6.51% Denmark, 6.30 % Sweden, Uruguay, 5.06%
Czech Republic, 4.5% Spain, 3% Argentina, 2,8%
Australia, 1,8% China, 1.40% France)

ROMANIA

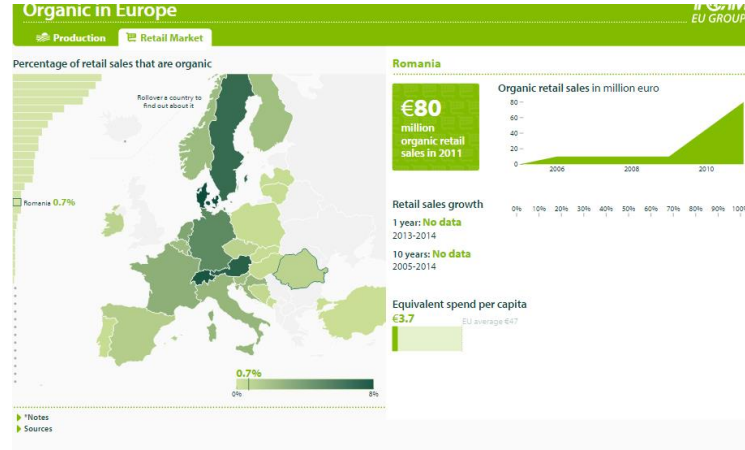
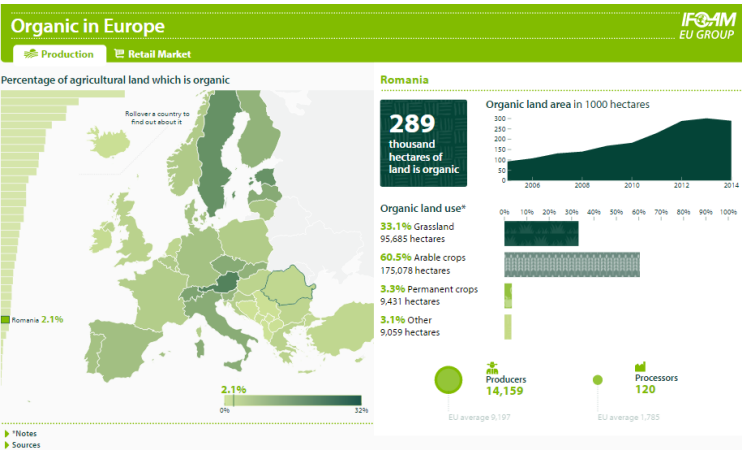
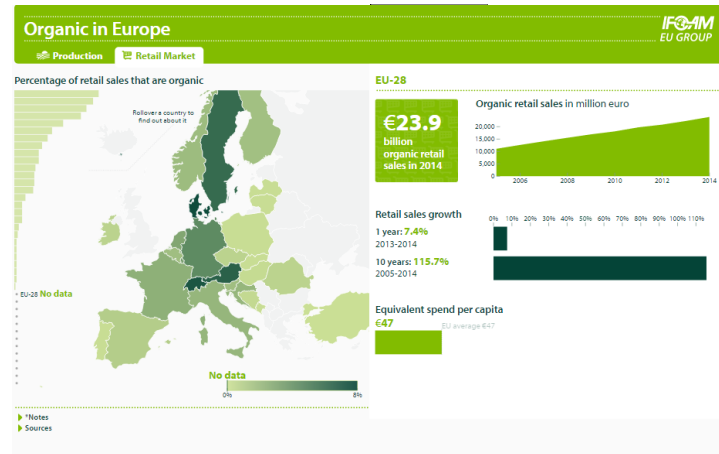
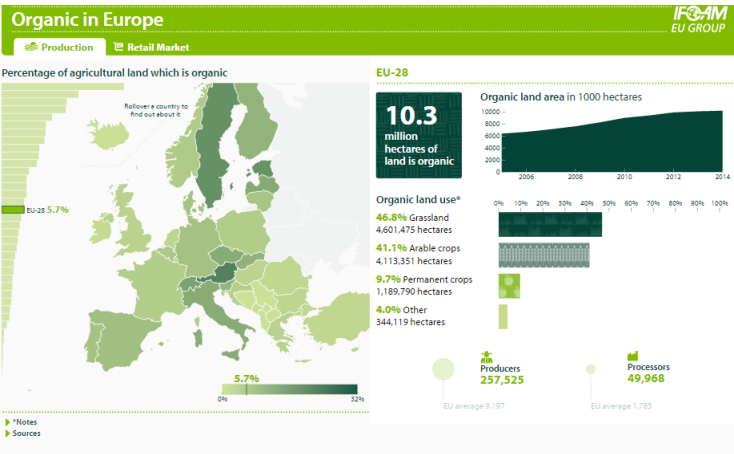
- dynamic system, with a weighted average annual growth rate of approximately 20%.
- in 2012, 288.261 ha certified, number of certified operators has increased 4.6 times compared to 2006



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Share of total organic area fully converted and under conversion, EU-28, 2014 (Eurostat, 2016)





- *Ocimum basilicum* L. – one of the most cultivated medicinal plants
- High amounts of volatile oils and non-volatile phenolics
- **Aim:** assessment of effect of organic fertilization on basil plants
- **Objectives:**
 - Evaluation of plant morphological parameters
 - Evaluation of physiological parameters
 - Evaluation of production of bioactive compounds

MATERIAL AND METHODS



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- **Plant materials:** seedlings of *Ocimum basilicum* L. – BioFarmland (Arad, Romania).
- V1: control (unfertilized), V2: Fylo (0.25%), V3: Geolino Plants&Flowers (0.1%), V4: Cropmax (0.1%), V5: Fitokondi (0.1%).
- The Latin square method, 81 plants per variant, randomized design with 3 repetitions
- 45 cm - the distance between rows, 15 cm - between plants
- Two fertilization (30 June - the beginning of the vegetative; 18 July - before the bloom)
- 7 August - harvest (middle of the bloom)





- Morphometrical assessments:** stem height, number of lateral stems.
- Physiological measurements:** fresh weight, photosynthesis rate, chlorophyll fluorescence (Fv/Fm).
- Biochemical parameters:** assimilatory pigments, total phenolics and flavonoid contents, antioxidant activity (DPPH - 2,2-diphenyl-1-picryl-hydrazyl-hydrate – method)

Table 1. Physico-chemical composition of the ecological foliar fertilizers

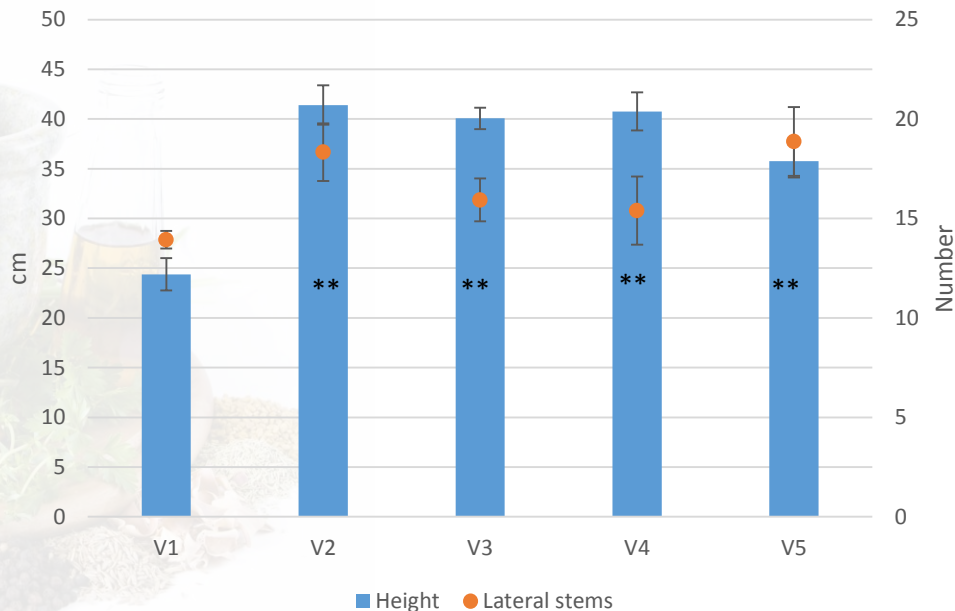
Foliar fertilizer	pH	N%	P%	K%
FYLO	4.37	32.33	1.28	1.04
GEOLINO	4.94	18.72	0.64	7.2
CROPMAX	4.5	0.2	0.4	0.02
FITOKONDI	4.5	0.02	0.01	0.26

They contain also plant growth stimulators: (auxins, cytokinins, gibberellins) - organic acids - vitamins – plant enzymes - trace elements (magnesium, zinc, manganese, copper, bor, calcium, molybdenum, cobalt, nickel)

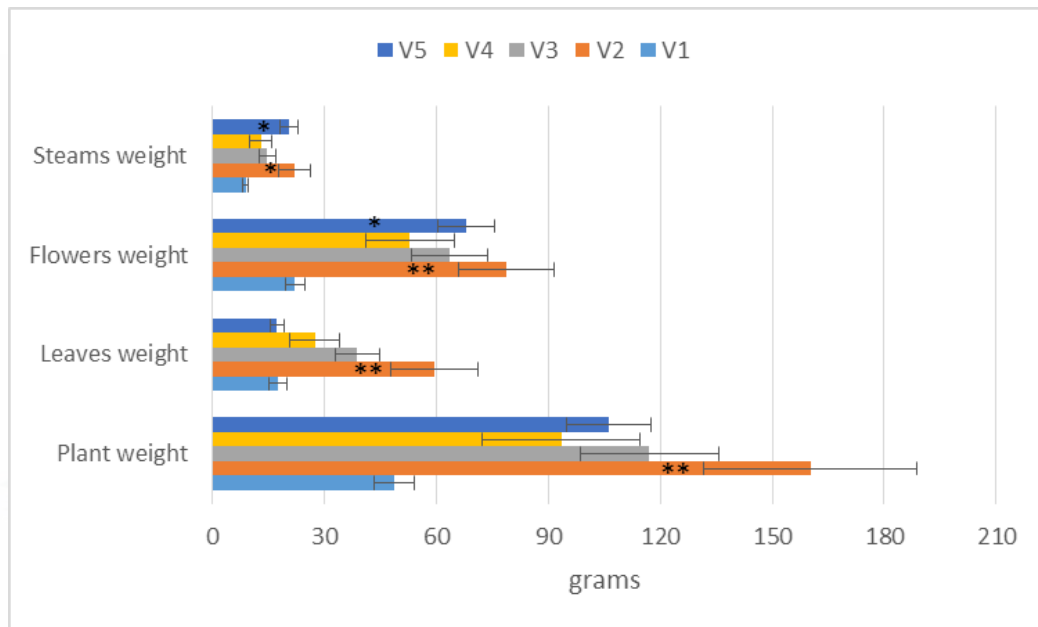
RESULTS



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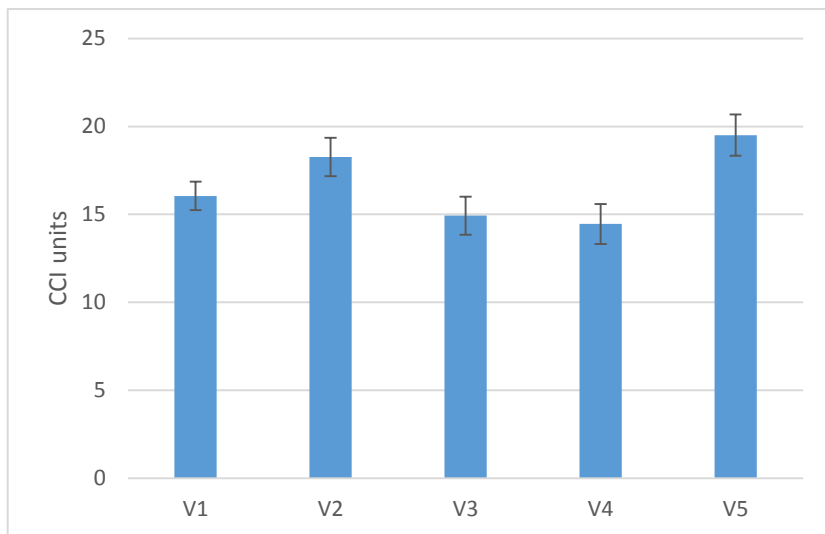
Plant height and lateral stem number of basil cultivated under ecological foliar fertilization: V1 – Control, V2- Fylo, V3 – Geolino, V4 – Cropmax, V5 Fitokondi (*-significant differences from control plants at $p < 0.05$; **-significant differences from control plants at $p < 0.01$).



Fresh weight of basil plants cultivated under ecological foliar fertilization: V1 – Control, V2- Fylo, V3 – Geolino, V4 – Cropmax, V5 Fitokondi (*-significant differences from control plants at $p < 0.05$; **-significant differences from control plants at $p < 0.01$).

Table 2. Increase of fresh weight of basil plants fertilized compared to control ones

Treatment	Plant weight %	Leaves weight%	Flowers weight%	Stems weight%
V2	228.8499	237.2405	254.7106	147.7857
V3	140.4259	120.7456	185.9674	65.78279
V4	91.82376	56.05514	138.4814	46.20114
V5	117.9062	-1.24866	207.0166	131.2753



Assimilatory pigments contents of basil plants cultivated under foliar fertilization: V1 – Control, V2- Fylo, V3 – Geolino, V4 – Cropmax, V5 – Fitokondi (*-significant differences from control plants at $p < 0.05$; **-significant differences from control plants at $p < 0.01$).

Table 3. Photosynthesis and transpiration rates of basil plants cultivated under foliar ecological fertilization

Treatment	Photosynthesis rate ($\mu\text{mols CO}_2/\text{m}^2/\text{s}$)	Transpiration rate ($\text{mmols H}_2\text{O}/\text{m}^2/\text{s}$)	Stomatal conductance ($\text{mols}/\text{m}^2/\text{s}$)	PPFD $\mu\text{mols}/\text{m}^2/\text{s}$
V1	19.86 \pm 2.17	20.9 \pm 1.09	2.41 \pm 0.34	893.62 \pm 80.37
V2	26.02 \pm 2.22	23.02 \pm 0.78	2.47 \pm 0.33	803.33 \pm 72.16
V3	20.26 \pm 1.72	23.99 \pm 0.94	0.9 \pm 0.05	1023.53 \pm 70.07
V4	16.78 \pm 1.61	19.74 \pm 1.21	2.68 \pm 0.46*	774.09 \pm 87.15
V5	19.66 \pm 2.23	18.72 \pm 0.97	1.79 \pm 0.31	677.62 \pm 93.38

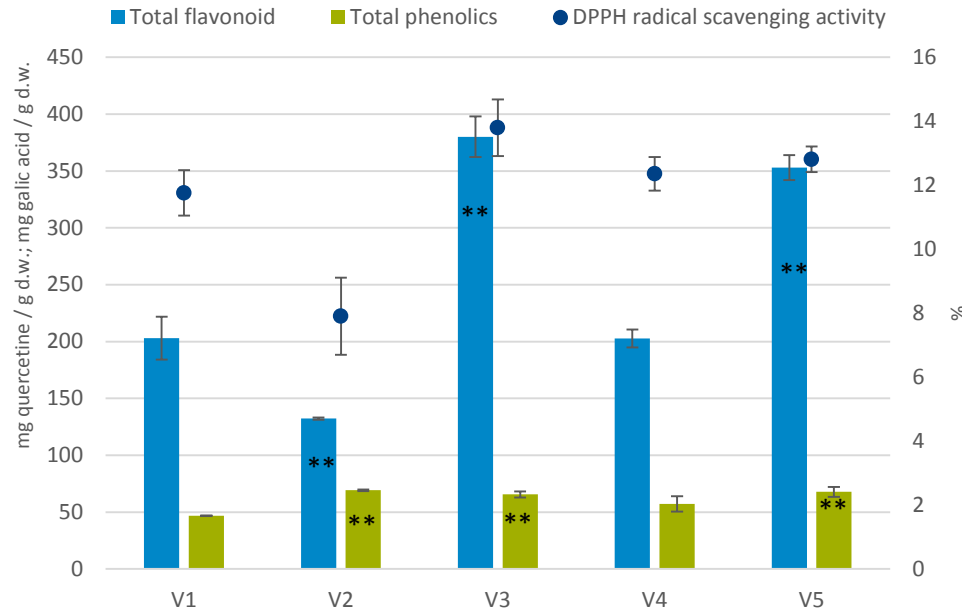
(* - significant differences from control plants at $p < 0.05$; ** - significant differences from control plants at $p < 0.01$),



Table 4. Chlorophyll fluorescence indices of basil plants cultivated under foliar ecologic fertilization

Treatment	Fo	Fm	Fv	Fv/Fm
V1	28.11±3.17	197.33±10.41	169.22±10.83	0.85±0.02
V2	34±2.01	180.56±15.52	146.56±15.49	0.8±0.02
V3	34.11±2.91	191.11±16.83	157±18.59	0.8±0.04
V4	38±1.68*	191.44±12.44	153.44±11.23	0.8±0.01
V5	38.44±2.71*	203.33±23.72	164.89±21.87	0.79±0.02

(*-significant differences from control plants at $p < 0.05$; **-significant differences from control plants at $p < 0.01$)



Total phenolics and flavonoid contents and free radical scavenging activity (%) of basil plants cultivated under foliar fertilization: V1 – Control, V2- Fylo, V3 – Geolino, V4 – Cropmax, V5 Fitokondi (*-significant differences from control plants at $p < 0.05$; **-significant differences from control plants at $p < 0.01$).

CONCLUSION



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"Medicus curat, Natura sanat"
"The physician treats, but nature heals." -
Hippocrates

- The ecological fertilizers treatments positively influenced the crop of *Ocimum basilicum* L.
- Significant increases of the investigated parameters
- Normal physiological response to fertilization
- Recommended to increase agro productivity of *Ocimum Basilicum* L.





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THANK YOU !

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