ANALIZA GOSPODARNOSTI GOJENJA IN PREDELAVE DALMATINSKEGA BOLHAČA (*Chrysanthemum cinerariifolium* (Trevir.) Vis.)

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IZVLEČEK

Hrvaška je pradomovina dalmatinskega bolhača, obenem pa je bila do leta 1920 celo v svetovnem merilu z 2000 ha njiv med pomembnejšimi pridelovalci te rastline. S svojimi primerjalnimi prednostmi (neonesnaženim okoljem in pedoklimatskimi razmerami) ima v primerjavi z drugimi evropskimi državami veliko možnosti, da se uveljavi kot evropski center ekološkega kmetijstva in ekološkega turizma, kar je tudi strateški cilj hrvaškega gospodarstva. Ker je v ekološkem kmetijstvu uporaba sintetičnih insekticidov omejena, je uporaba naravnega piretrina, pridobljenega iz dalmatinskega bolhača, sredstvo, brez katerega bi si težko predstavljali varstvo rastlin pred škodljivci v taki proizvodnji. V raziskavo, ki je potekala v okolici Poreča (Hrvaška), so bili vključeni trije kloni dalmatinskega bolhača. Opravljene analize gojenja in predelave dalmatinskega bolhača so pokazale zadovoljive rezultate, kar zadeva proizvodne in ekonomske kazalce. Ugotovljeno je bilo, da je gojenje dalmatinskega bolhača gospodarsko upravičeno le ob strojnem spravilu pridelka (proizvodna cena za enega od klonov je višja od prodajne cene), medtem ko je proizvodnja povsem nedonosna ob ročnem spravilu (proizvodna cena je pri vseh treh klonih višja od prodajne cene). Zato je treba nadaljevati gojenje dalmatinskega bolhača v poljskih poskusih z namenom da bi izboljšali tehnično-tehnološke osnove v njegovi proizvodnji.

Ključne besede: dalmatinski bolhač, *Chrysanthemum cinerariifolium* Trevir. Vis., analiza gospodarnosti, gojenje, predelava

ECONOMIC PROFITABILITY OF DALMATIAN PYRETHRUM (*Chrysanthemum cinerariaefolium Visani*) PRODUCTION AND PROCESSING

ABSTRACT

Croatia is the homeland of Dalmatian pyrethrum, in the year 20-ties of 20 century it had a production on 2000 hectares. With comparative merits (clear environment and favourable climatic conditions) comparing to other European countries, Croatia has a great possibility to become a centre of organic agriculture and eco tourism, what is also a strategic goal of Croatian economic policy. As organic agriculture disapproves usage of chemically sintetisized means, the natural pyrethrums from Dalmatian pyrethrum could be necessary for pest treatment. On a location in Poreč, Croatia, we examined three clones of Dalmatian pyrethrum. Production and processing was analysed. The results showed economically favourable effects. We noticed that production was feasible only with mechanised harvesting (because the production of one clone is more expensive than the rand some sum); while with manual harvest it costs more than the production of three clones. Therefore it is necessary to continue field research on Dalmatian pyrethrum in order to improve technical and technological base for production.

Key words: Croatia, Dalmatian pyrethrum, natural pyrethrums, organic agriculture, profitability

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1. INTRODUCTION

Dalmatian pyrethrum is a plant variety that grows in wilderness in Dalmatia (Republic Croatia) and Herzegovina (Federal state of Bosnia and Herzegovina). Its production in Croatia on arable land is known for decades (Ožanić, 1955; Kolak *et al.*, 1999). Pyrethrum is growing on carst, sunny areas, on sandy, rocky, porous soils, poor with limestone (Kušan, 1947) which are characteristics in Mediterranean parts of Croatia. Various pyrethrum preparations were used for plant protection over 160 years against insects (Filipaj, 1997). The majority of pyrethrine, the active substance, is located in flower heads. Pyrethrum is effective in suppressing insects on plants, while it's not toxic for warm blooded animals. On air and sun, pyrethrine decomposes to inactive compounds. Therefore pyrethrins have no side effects on the environment, and their use is approved in ecological production. As ecological production has increased in the last ten years, the demand for Dalmatian pyrethrum extracts had grown. Although Croatia (Dalmatia) was the worldwide largest producer at beginning of the 20th century with 900 tons/year (Filipaj, 1994), this production was relinquished. Production leaders today are Kenia, Tanzania, Ecuador, Ruanda and Japan, which have introduced Dalmatian pyrethrum to production. Because the origin of pyrethrum and tradition of production, there are no limits which could prevent Croatia of becoming again a leader in pyrethrum extracts production worldwide. Therefore this research had an aim to determine marketable-economic profitability of Dalmatian pyrethrum production in Istra (Croatia).

2. MATERIALS AND METHODS

Field experiments were set in west Istra (Poreč). We examined three pyrethrum clones: Dalmatian, Kenyan and Tanzanian (clone I, clone II and clone III). Meliorative manuring was carried out with 30 tons stable dung per hectare. Seedlings were planted by hand on prepared soil (ploughing on 30 cm, and then harrowing) on 30. April 2002, in three double lines per plot (100 cm + 50 cm x 30 cm) to obtain a density of 44,444 seedlings/ha. The supply cost per seedling was 0.13 EUR/peace. In productive years we used ecologically acceptable manure (500 kg/ha). Against diseases we used 1.5% Bordeaux blue suspension. In field we examined following attributes: day of flourishing, plant heights, diameters, lodging of plants, number of flowers per plant, flower mass, flower yield. The harvest was done mechanised – by combine harvester. After harvest flowers were dried and prepared for laboratory analyses. Chemical analyses were done for all three clones in order to determine differences in chemical compounds and pyrethrum shares. Costs of pyrethrum growing were separated for the first year (land preparation and setting up the plantation) and production years (from second till tenth). An our of human labour costs 2.67 EUR. Economical length of plantation exploitation was 10 years. Total business revenues were obtained by marketing pyrethrum pulver as final product. The normative was 3 grams of pyrethrum per package. For each clone we measured rent ability as an economical parameter for production and processing. The volume of production and processing was determined by the quantity of flowers which were produced on one hectare of land during ten years of plantation exploitation.

3. RESULTS AND DISCUSSION

Procedures for plantation set-up were equal for all three pyrethrum clones. We pursued the same working operations and used same quantity of materials. For land preparation during the first year we used 67 hours of tractor work and 134 hours of human labour. Although the harvest was mechanised, the high input of human labour was a consequence of seedlings planting (about 60 hours/ha).

Table 1: Costs of land preparation, planting and growing pyrethrum in the first vegetation year per clone

Elements for calculation	**Value in EUR**		
	Clone I	Clone II	Clone III
Tractor work costs	470	470	470
Human labour costs	357	357	357
Material costs	6,476	6,476	6,476
Other costs	365	365	365
Total costs	7,668	7,668	7,668

Costs for land preparation, pyrethrum planting and growing were equal for all three clones. In the group of material costs the majority refers to seedlings – to achieve planned density we needed 44,444 peaces/ha.

Table 2: Costs of pyrethrum growing in productive years per clone

Elements for calculation	Costs per productive year (EUR)		
	Clone I	Clone II	Clone III
Tractor work costs	568	568	568
Human labour costs	370	368	363
Material costs	346	344	337
Other costs	64	64	63
Total costs	1,348	1,345	1,331

Production technology for all three pyrethrum clones was equal; therefore the costs in productive years were depending on yields, respectively, procedures connected to it. The highest yield was achieved by production of clone I (3,192 kg/ha fresh, related to 1,129 kg/ha dry), while the lowest had clone III (2,233 kg/ha fresh, related to 780 kg/ha dry substance). Calculation was done presuming mechanised harvesting – by combine harvester.

Table 3: Costs of dry pyrethrum flower per clone

Description	Value per clone		
	Clone I	Clone II	Clone III
Costs in the year of planting (EUR/ha)	7,668	7,668	7,668
Costs in production year (EUR/ha)	1,348	1,345	1,331
Total production costs in 10 years (EUR/ha)	19,800	19,769	19,651
Average yield of dry flower heads in 10 years (kg/ha)	150	141	104
Total yield of flower heads in 10 years (kg/ha)	1,354	1,269	936
Price of dry flowers (EUR/kg)	1.95	2.08	2.80
Share of active compound in dry flowers	1.5%	1.5%	1.5%
Total amount of active compound (kg)	20	19	14
Price of active compound (EUR/kg)	130	139	187

We determined that best yields and lowest costs were obtained by clone I, while the worst results were determined by clone III. The price of one kg dry flower heads for clone I was 1.95 EUR/kg, while for clone III, 2.80 EUR/kg. It should be mentioned if the harvest is done by hand (with efficiency of 1.4 kg fresh flower/our) the price of flowers would be

significantly higher: 3.54 EUR/kg for clone I, 3.64 EUR/kg for clone II and 4.22 EUR/kg for clone III.

Table 4: Costs of pyrethrum processing and final product production

Type of cost	Costs of pyrethrum processing (EUR)		
	Clone I	Clone II	Clone III
Costs of materials and services	43,027	41,796	37,021
Costs of human labour	6,501	6,089	4,493
Amortization	10,180	10,180	10,180
Other costs	2,709	2,537	1,872
Total	62,416	60,603	53,567

Considering that analysed clones had different yields per land unit, the amounts of dry pyrethrum flowers for processing were different and therefore variable costs of final product production were different too. Total costs of pyrethrum processing for clone I were 3% higher than for clone II, and 14.4% higher than for clone III. In the structure of material costs the raw material had the highest value - 46% of total material costs. Package and transportation costs came next in material costs.

Table 5: Total revenue and profit of pyrethrum production per clone

Description	Unit of measure	Value per clone		
		I	II	III
Buhač - pulvis	Package	6,771	6,343	4,680
Market price	EUR/package	1.87	1.87	1.87
Total revenue	EUR/ha in 10 years	94,800	88,800	65,520
Brutto profit	EUR/ha in 10 years	32,384	28,197	11,953

Since the market prices of pulver for all three clones were equal, the ranges of total revenues were proportional to product amount. All three clones obtained profit as follows: clone III – 12 thousand EUR, clone I – 32 thousand EUR.

Table 6: Indicators of economic profitability in pyrethrum production per clone

Indicator	Clone I	Clone II	Clone III
Labour productivity (EUR/work our)	36.39	35.19	29.72
Production efficiency	1.52	1.47	1.22
Rentability of total business means (%)	2.5	2.2	0.9

Based on determined indicators for economic profitability we can claim that Dalmatian pyrethrum achieves middle range economic-financial results comparing to other agricultural crops in Croatia. These economic results are higher than the average economic profitability of family farms in Istra (Oplanić, 2003).

4. CONCLUSIONS

Research results showed that buhač growing is marginally profitable either non-profitable in case of manual harvesting. Therefore it is necessary to organize production on larger production units (over 50 hectares). Only under this circumstance the production would be economically feasible. In case of mechanised harvesting, buhač could obtain in Istra favourable results in production and economic values, which depends on clones. Highest revenues and gross profit annually had clone I – 3,200 EUR/ha (Dalmatian buhač), while the lowest revenues were obtained by Tanzanian buhač (clone III) – 1,187 EUR/ha annually.

5. REFERENCES

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