

Last updated: 29th May 2003

ERUCA (ROCKET)

Family: *Cruciferae*

Genus: *Eruca*

Species: *sativa*



Source: <http://aoki2.si.gunma-u.ac.jp/BotanicalGarden/HTMLs/rocket-salad.html>

Contents

[General Background](#)

[Details of Quality Characteristics](#)

[Current Production and Yields](#)

[Constraints upon Production](#)

[Markets and Market Potential](#)

[Other Information](#)

[Research](#)

[Useful Websites](#)

[BioMat Net](#)

[Contacts](#)

[References](#)

General Background

Eruca is an annual or over wintering herb with a stale and unpleasant odour. It has a slender tap root and an erect usually stiff, little branched hairy stem, 10 - 60 cm in height. Lower leaves are stalked, upper leaves are more or less sessile and all are pinnatisect or rarely pinnate, with a long oblong or obovate terminal lobe which is coarsely toothed or lobed, rarely entire. Leaves appear very similar in appearance to dandelion. Flowers are relatively large, few and in small terminal racemes. Petals are 12 - 20mm, pale yellow or whitish with deep violet veins, twice as long as the sepals. Fruits are a cylindrical siliqua about 3 times as broad as long (12 - 25 x 3 - 5 mm), erect and more or less parallel to the stem on short erect stalks and with a flattened beak. Seeds are 1.5 - 2mm, yellow-brown or reddish, spherical or ovoid in 2 rows in each cell.

Eruca is a native of southern Europe and central Asia where it has been cultivated since classical times. It is not a commercial crop in the UK or northern Europe but is widely grown in kitchen- and market-gardens in southern France, Italy, Greece and the near East where it is used for flavouring salads. The plants are naturalised in waste places, road shoulders and fallow fields in northern and western Europe, well beyond its original range. *Eruca* is also sometimes referred to as Rocket, True Rocket, Rocket Salad, Arugula, Roquette or White Pepper.

Details of Quality Characteristics

As the generic name implies, rocket is high in erucic acid, C22:1 (*cis*-13-docosenoic acid). Other crops high in erucic acid are oilseed rape and *Crambe*.

Table 1. Fatty acid composition in seed oil of *Eruca sativa* from Germany.

Total Oil (%)	29.1
Fatty acids	% of the total content (average of 4 replicates)
Palmitic C16:0	5.1
Stearic C18:0	1.3
Oleic C18:1	15.1
Linoleic C18:2	8.3
Linolenic C18:3	14.7
Eicosenoic C20:1	7.4
Erucic C22:1	44.7

Source: Rocket: A Mediterranean crop for the world (1996)

Essential oil from the leaves of *Eruca sativa* contains 67 volatile components, representing 96.52% of the oil. The oil is characterized by a high content of sulphur and nitrogen containing compounds (Miyazawa *et al*, 2002).

Current Production and Yields

Rocket is grown on a commercial scale in Portugal for export to the UK and other northern European countries as a 4th generation salad product i.e. prepared and sold in sealed bags after having been cleaned and mixed with other leafy vegetables (Joao C. Silva Dias 1996). High levels of nitrogen applied increase fresh yield by up to 50% (Ahmed *et al*, 2002). In trials oilseed yields of 180-350kg/ha have been achieved, commercial yields are currently unknown although they are predicted to be similar.

Constraints upon Production

Unlikely to be suited for production in cooler northern European climates. *E. sativa* is well known for its outstanding drought tolerance, as a result it plays an important role in oilseed production in arid and semi-arid regions around the world.

Markets and Market Potential

Eruca seed oil is mainly used in industries as a lubricant, for soap-making, as an illuminating agent, in massaging, in medicines and in cooking as a salad oil. Erucic oil is sometimes used for adulterating rapeseed/mustard oil. The oil cake can be used as a source of cattle feed and a manure/mulch.

The young plants are used as a salad, vegetable and as green fodder. Tender leaves are reported to have stimulant, stomachic, diuretic and antiscorbutic activity (Bhandari and Chandel, 1996). Leaves are similar in taste to a relative of eruca, the radish. When grown for salad purposes leaves are best taken young (only a foot tall or so), they would eventually reach 2-3 feet tall but leaves become bitter tasting and strongly pungent.

High erucic acid (HEA) oil has special properties which include: High smoke and flash points, oiliness and stability at high temperatures, ability to remain fluid at low temperatures and durability. HEA oil is used to produce erucamide which is used as a slip additive in polythene and polypropylene, to reduce surface friction and prevent adhesion between film surfaces. HEA oil is also used in printing inks, lubricants and has a range of other applications.

Eruca contains the glucosinolate methylsulphinylbutyl isothiocyanate which induces enzymes which have anticancer activity.

There is an increasing world demand for the amide of Erucic acid (erucamide). Hydrogenation of erucic acid with subsequent fractionation yields behenyl alcohol which is used in cosmetics and was used in large quantities as foam control in machine detergents. Esters and amides of behenic acid are used in lubricants for PVC and antiblocking agents for polyolefin films. Ozonolysis of erucic acid yields brassylic acid used in the manufacture of polyamides (nylon 6/13 and 13/13) and esters which are used as low temperature plasticizers and as lubricant components. Current world production of erucic acid is 25,000 mt/annum. Consumption of HEA in the EU was 40,000t/annum in 2000 and is predicted to increase to 55,000t/annum by 2005.

The largest current applications for High Erucic Acid (HEA) oil are in polymer additives and detergents. As the crude oil is biodegradable it provides an alternative to mineral oil in many industrial applications. It may have application as a lubricant for chainsaws.

Other Information

Eruca matures from seed in 2-3 months, periods of very warm temperatures cause it to bolt rather quickly. It appreciates full sun although shade should be provided from midday sun in summer. The crop also appreciates regular watering or adequate rainfall. It can tolerate temperatures down to -4°C .

There are only a small number of regulated herbicides available for eruca and these do not provide a wide range of action and a good degree of selectivity. Weed control must therefore be carried out by alternative physical or agronomic means. However *Eruca sativa* covers the soil very quickly and often weeds are unable to grow after a short while.

Fungal attacks to the young seedling can be common i.e.: *Fusarium* spp, *Sclerotinia* spp and *Phoma* spp. Few pests are likely to bother the crop, probably due to its pungency. Flea beetle is the greatest potential problem and can be particularly damaging, feeding on the plants throughout the season and leaving them unmarketable. Control of the flea beetle is difficult, although there are chemicals available environmental problems arise from their use. These

chemicals are not selective and their persistence makes them unsuitable for use in such a short-cycle crop. The only viable controls are natural pyrethrins. (Ciampolini *et al*, 2001)

Research

Research is currently underway to use *Eruca* genes to improve Brassica crops such as oilseed rape (*Brassica napus*). Some accessions of *Eruca sativa* have been shown to possess resistance to the stem canker pathogen (*Leptosphaeria maculans*) which is an important pathogen of oilseed rape.

Methylsulphonylbutyl isothiocyanate induces enzymes which have anti-cancer activity and is found in *Eruca* but not in oilseed rape. This glucosinolate has much greater potency than those isothiocyanates which do occur in oilseed rape. It may therefore be possible to alter the flavour composition and the nutritional value of oilseed rape through the intergression of *Eruca* genes. (Magrath and Mithen, 1996)

Useful Websites

http://www.hort.purdue.edu/newcrop/nexus/Eruca_sativa_nex.html - Several links to useful sites providing information on Rocket

<http://www.ipgri.cgiar.org/publications/pdf/234.pdf> - Rocket: A Mediterranean crop for the world.

BioMat Net

Contacts

References

Ahmed, A.H.H., Khalil, M.K. and Farrag, A.M., (2002) Nitrate accumulation, growth, yield and chemical composition of rocket (*Eruca sativa*) plant as affected by NPK fertilisation, kinetin and salicylic acid. *Annals of Agricultural Science (Cairo)* **47** (1), 1-26

Ciampolini, M., Regalin, R., Guarnone, A. and Farnesi, I., (2001) Widespread and severe attacks by flea beetles (*Phyllotreta* spp.) on *Eruca sativa*. *L'Informatore Agrario*. **57** (48), 87-91

Clapham, A.R., Tutin, T.G. and Warburg, E.F. (1962) *Flora of the British Isles*. Cambridge University Press.

Bhandari, D.C. and Chandel, K.P.S. (1996) 'Status of rocket germplasm in India: research accomplishments and priorities. **In:** *Rocket: A Mediterranean crop for the world*. 13-14 Dec 1996. pp.67

De Rougemont, G.M. (1989) *Crops of Britain and Europe*. Collins.

Joao C. Silva Dias. (1996) 'Rocket in Portugal: botany, cultivation, uses and potential'. **In:** *Rocket: A Mediterranean crop for the world*. 13-14 Dec 1996. pp.81-85.

Gunstone F.D. and Herndlöf (1993) *A Lipid Glossary*. The Oily Press.

IENICA Summery report for the European Union. 2000

Magrath, R. and Mithen, R., (1996) 'How do we use *Eruca* to improve Brassica crops. **In:** *Rocket: A Mediterranean crop for the world*. 13-14 Dec 1996. pp.23-25

Miyazawa, M., Maehara, T. and Kurose, K., (2002) Composition of the essential oil from the leaves of *Eruca sativa*. *Flavour and Fragrance Journal*. **17** (3) 187-190

Rocket: A Mediterranean crop for the world. Report of a workshop 13-14 December 1996. Legnaro, Italy. S. Padulosi and D. Pignone (editors)

Zoebelein, Hans (1997) *Dictionary of Renewable Resources*. Weinheim.

