

- 7.4.6. *Amaranthus lividus* L., Sp. Pl., ed. 1, 990 (1753); Boulos, Fl. Egypt 1: 135 (1999).  
Syns. *Amaranthus blitum* L., Sp. Pl., ed. 1, 990 (1753);  
*Amaranthus oleraceus* L., Sp. Pl., ed. 2, 1403 (1763);  
*Amaranthus ascendens* Loisel., Not. Fl. France, 141 (1810).

### Proximate Composition, Proteins and Lipids

The proximate composition and amino acids of *Amaranthus lividus*, growing in Egypt are shown in Tables 38 and 39 (Abu-Ziada *et al.*, 2008). The study carried out by El-Halawany *et al.* (2008) indicated that the plant may be added to the non-conventional forage to be used as a source to produce rich fodders for live-stock and poultry. *Amaranthus lividus*, compared with six forest vegetables growing in China contains the highest contents of crude protein, carotene, vitamin C, Ca, and P, which reach 5.52 g/100 g, 7.15 mg/100 g, 152.74 mg/100 g, 609.24 mg/100 g, and 92.51 mg/100 g, respectively, much higher than those in the amaranth (He and Zhang, 2009). The total carotenoids and  $\beta$ -carotene content of the plant amounted to 24.70 and 6.04 mg% respectively (Rajyalakshmi *et al.*, 2001).

The total iron content of the green leafy plant is  $13.4 \pm 2.7$  (Gooneratne and Kumarapperuma, 2007). A survey of some vegetables from Bangladesh showed a high value of As (160  $\mu$ g) in the plant (Al Rmalli *et al.*, 2005). There are several publications on the arsenic contamination of the plant (e.g. Alam *et al.*, 2003a,b; Das *et al.*, 2004).

The foliage of 61 accessions of *Amaranthus* comprising both the grain and vegetable types and referable to 10 species (including *Amaranthus lividus*) were evaluated for carotenoid, protein, nitrate, oxalate, and moisture contents (fresh weight). Carotenoid varied from 90 to 200 mg/kg in vegetable types and from 60 to 200 mg/kg in the leaves of grain types. Variation for leaf protein was 14-30, 15-43; nitrate 1.8-8.8, 4.1-9.2; oxalate 5.1-19.2, 3-16.5; and moisture 780-860, 750-840 g/kg in vegetable and grain types, respectively. Leaf protein of some high-carotenoid lines revealed a well-balanced amino acid composition with high lysine (40-56 g/kg). Variation of all five parameters (carotenoid, protein, nitrate, oxalate, and moisture) with respect to the leaf position in vegetable types (4- and 8-week-old plants) and with respect to age (1- to 4-mo-old plants) in grain types was also reported (Prakash and Pal, 1991). The protein, fat and fatty acid composition in the seeds of 41 lines of amaranth (*Amaranthus* spp. comprising *Amaranthus lividus*) including both the grain and vegetable types were as follows: protein varied from 103 to 183 g kg<sup>-1</sup> and fat from 8 to 68 g kg<sup>-1</sup>. Hexadecanoic, octadecenoic and octadecadienoic acids were the major fatty acids of the oil

(Prakash and Pal, 1992). The protein and oil in 6 species of *Amaranthus* (including *Amaranthus lividus*) were 12.6 - 17.5 and 3.5 - 5.7% respectively (Prakash *et al.*, 2001).

The oil from *Amaranthus blitum* var. *oleracea* contains the following fatty acids: myristic, 0.6; palmitic, 17.1; stearic, 5.3; arachidic, 1.4; behenic, 1.6; oleic, 35.3; and linoleic, 38.7 % (Badami and Patil, 1976). Fatty acid compositions of the seed oils of 30 species (including *Amaranthus ascendens*) had been investigated. The incidence of unusual fatty acids such as octadecatetraenoic, eicosenoic, eicosatrienoic, epoxy, allenic, trienoic, and isolated *trans* double-containing acids was discussed (Lotti *et al.*, 1991).

### Other Constituents

Quercetrin and vitamin K were identified in *Amaranthus blitum* var. *oleracea* (Ganju and Puri, 1959). Abdulla-Zade and Agamirova (1964) reported that the poisonous plants growing in Azerbaidzhan, including *Amaranthus blitum*, contain 0.63-0.73% of total alkaloids in the leaves and 0.40-0.45 % in the stems. The betacyanin pigments from 21 genotypes of 7 *Amaranthus* species (including *Amaranthus lividus*) were identified as homogeneous betacyanins, which consisted on average of 80.9% amaranthine and 19.2% isoamaranthine. Dried crude betacyanin extracts contained 23.2-31.7% protein, and the purified sample retained 12.8% protein. Total betacyanins in the *Amaranthus* species ranged from 46.1 to 199 mg/100 g of fresh plant material and from 15.4 to 46.9 mg/g of dry extracts. The mean extraction rate of the eight best genotypes was 2.18%. *Amaranthus* cultivated species contained much more betacyanin than wild species and had much higher biomass, indicating that certain cultivated genotypes had greater potential for commercial development as natural colorant sources. Amaranthine, isoamaranthine and betanine were identified in *Amaranthus lividus* (Cai *et al.*, 2001). Dried extracts from *Amaranthus* species may form natural nutritive pigments for the food industry (Cai *et al.*, 1998a). The antimicrobial compound of *Amaranthus lividus* was identified as diethyl phthalate (Oh and Lee, 2005).

The extracts of different plant parts showed antioxidant activity (Ozsoy *et al.*, 2009).