7.2.2. ***Aerva lanata*** (L.) Juss. ex Schult. In Roem. & Schult., Syst. Veg., ed. 15, 5: 564 (1919); Boulos, Fl. Egypt 1: 138 (1999).
Syn. *Achyranthes lanata* L., Sp. Pl., ed. 1, 204 (1753).

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Proximate Composition and Carbohydrates

The leaves were found to be moderately high in carbohydrates (26.6 g/100 g), crude protein (22.6 g/100 g) and ash (31.2 g/100 g). Mineral composition (mg/100 g) revealed that the leaves were high in P (187), and moderately high in other minerals such as K (47.9), Na (39.4), Ca (51.7), Mg (41.5), Zn (44.7), Fe (11.0) and low in Mn (1.04). Heavy metals such as Cu, Pb, Cd and Cr were not detected in the leaves. The anti-nutrient levels also revealed the presence of tannic acid, saponins, alkaloids, flavonoids and oxalate, with values ranging from 0.35 to 11.4%. Other antinutients were phytic acid and phytin – phosphorus; their level was a good indication that the leaves could be save for human consumption (Omoyeni and Adeyeye, 2009). The proximate composition of the plant, growing in Nigeria, has been reported as follows: moisture, 2.2 ± 1.8; ash, 13.1 ± 5.4; protein, 11.3 ± 5.2; fat, 25.2 ± 7.9; fiber, 26.2 ± 3.3, carbohydrates, 22.0 ± 2.6 (g/100 g dry weight); phytate, 6780; Ca, 18.4 and Zn, 53.2 (mg/100g) (Emmanuel *et al*., 2010). The minerals of *Aerva lanata*, growing in Egypt are P, 0.065; K, 2.106; Mg, 1.014; Na, 0.192; Ca, 3.5 %; Pb, 10; Fe, 197.6; Mn, 39.6; Zn, 40.35; Cu, 11.4; Cd, 0.4 and Li, 1.05 ppm (Wassel *et al*., 1997). The values of proximate composition (moisture, ash and different extracts) of *Aerva lanata* were found to change with season and region of collection (Mammen *et al*., 2010). *Aerva lanata* has high vitamin A activity (1.80 mg% expressed as retinol equivalent) with total carotenoids and β-carotene amounting to 25.97 and 10.49 mg% respectively (Rajyalakshmi *et al*., 2001) and mineral elements (Biswas, 2007; Rao *et al*., 2010) of the plant.

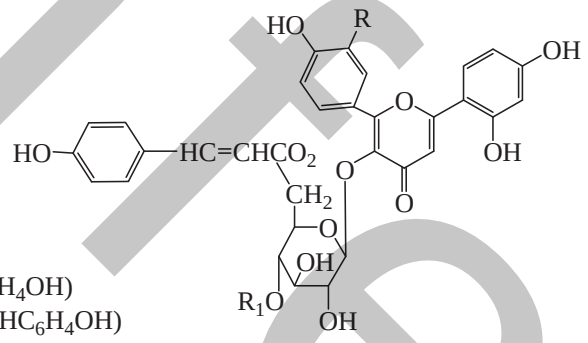
Aerial parts of flowering and fruiting *Aerva lanata* contained hemicellulose, starch, an acid-soluble, and water-soluble polysaccharides. Galactose, glucose, mannose, xylose, arabinose and rhamnose were detected in these polysaccharides (Mallabaev *et al*., 1989). Investigation of the carbohydrates of the aerial parts of *Aerva lanata*, growing in Egypt, revealed the presence of arabinose, rhamnose, xylose, galactose, glucose, mannose, mannitol (4.2%), and a polysaccharide of pectic nature (4.8%) (Aboutabl *et al*., 1997).

Lipids, Steroids and Terpenoids

Aerva lanata has been reported to contain the following triterpenoids and steroids: α-amyrin, betulin, lupeol, olean-12-en-28-oic acid 3,16-dioxomethyl ester, β-sitosterol, β-sitosterol-D-glucoside (daucosterol), β-sitosterol palmitate, campesterol, stigmasterol, stigmasterol acetate, and ergosterol (Aiyar *et al*., 1973; Wassel and Ammar, 1987; Chandra and Sastry, 1990; Zapesochnaya *et al*., 1990; Abdel-Wahab *et al*., 1997). Several other compounds as mentioned above in *Aerva javanica*, have been identified from the unsaponifiable matter of the plant growing in Egypt. The fatty acids detected in the plant are: lauric (4.120), myristic (0.853), myristoleic (11.915), palmitoleic (41.72), stearic (6.040), oleic (9.637) and linoleic (19.231%) acids (Abdel-Wahab *et al*., 1997). The presence of phyto-ecdysteroids in the plant is also reported (Baltaev *et al*., 1992).

Flavonoids and Other Phenolics

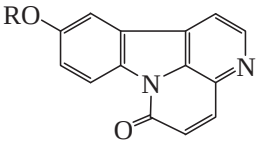
Four acylated flavonoid glycosides (**63**-**66**) were isolated from *Aerva lanata*. Kaempferol derivatives (tiliroside and coumaroyltiliroside) dominated among the acyl glycosides, while their isorhamnetin analogues were present in minor amounts (Zadorozhnii *et al*., 1986). The flavonoids identified from the plant are: chrysin (Wassel and Ammar, 1987), aervitrin (isorhamnetin 3-rhamnosylrutinoside), narcissin (isorhamnetin 3-rutinoside) (Pervykh *et al*., 1992) and isorhamnetin 3-*O*-β-D-glucoside (Yuldashev *et al*., 2002), kaempferol 3- (6"-*p*-coumaryl)-*O*-glucoside, isorhamnetin 3-(6"-*p*-coumaryl)-*O*-glucoside (Rajesh *et al*., 2011). The contents of the total flavonoids in the plant varied from 0.51 to 1.02 % (calculated as rutin) (Kurkina and Osipova, 2010). The aerial parts of the plant contain vanillic, syringic, and ferulic acids (Zapesochnaya *et al*., 1990; Yuldashev *et al*., 2002).



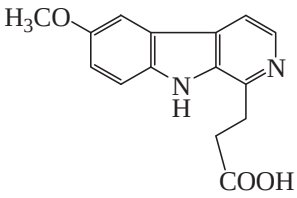
63 R =R^1= H
64 R = OMe , R^1 = H
65 R = H , R^1=(COCH=CHC_6H_4OH)
66 R = OMe , R^1 = (COCH=CHC_6H_4OH)

Alkaloids

The following alkaloids have been isolated from *Aerva lanata*: aervin (ervine, 10-hydroxycanthin-6-one, **67**), methylervine (10-methoxycanthin-6-one, **68**), ervoside (erveoside, 10-*O*-β-D-glucopyranosyloxycanthin-6-one, **69**), and ervolanine [3-(6-methoxy-β-carbolin-1-yl)-propionic acid, **70**)], canthin-6-one and 3-(β-carboline-1-yl)propionic acid (Zapesochnaya *et al*., 1991a,b, 1992). Aervin, methylaervin and canthin-6-one were identified from *Aerva lanata*, growing in Egypt (Ammar *et al*., 1996). Feruloyltyramine and feruloylhomovanillylamine were isolated from the herb of the plant (Zapesochnaya *et al*., 1990).



67 Ervine R = H
68 Methyl ervine R = CH_3
69 Ervoside R = β-D- Glu



70 Ervolanine

Other Constituents

HPTLC (Mammen *et al*., 2011; Yamunadevi *et al*., 2011a,b) and FTIR (Ragavendran *et al*., 2011; Mariswamy *et al*., 2012) studies revealed the presence of alcohols, phenols, alkanes, carboxylic acids, aldehydes, ketones, primary amines, nitro compounds, esters, ethers, amides, glycosides and 30 different types of steroids. HPTLC of the methanolic extracts of stem, leaves, root, flower and seeds of *Aerva lanata* showed the presence of 21 different types of saponins (Yamunadevi *et al*., 2012).

The different constituents, as well as traditional uses and pharmacological effects of *Aerva lanata* have been reviewed by several authors (e.g. Goyal *et al*., 2010; Rajesh *et al*., 2011).