

#### 4.1 I N T R O D U C T I O N

*Daucus carota* (family Umbelliferae) commonly known as "Gajar" is the common carrot, which is indigenous to Kashmir and Western Himalayas, and is now largely cultivated in India and Pakistan.

Carrot is reputed in indigenous systems of medicine to have a beneficial influence on kidneys, prevents the brick-dust sediment sometimes found in urine and is useful in the treatment of dropsy. It is also used as an antiseptic, prevents putrescent changes within the body and is said to be a "blood-purifier". The seeds are used as aphrodisiac and nerve tonic. The seeds are aromatic, stimulant and carminative.<sup>176</sup>

The alcoholic and aqueous extracts of the seeds showed encouraging antifertility activity by preventing implantation in 66.6 percent and 60 percent rats respectively. These extracts also exerted some abortifacient activity.<sup>177</sup> The chloroform fraction of the petroleum-ether extracts of the seeds was found to have encouraging antifertility activity in female albino rats.<sup>178</sup> The

chloroform and methanol fractions of petroleum-ether extracts, chloroform-methanol (9:1) fractions of the alcoholic extract and chloroform and ethylacetate fractions of the aqueous extract showed 80 to 100 percent inhibition of implantation in rats.<sup>179</sup> Studies on anti-progestational activity revealed that the aqueous extracts of the drug suppressed the formation of deciduoma and the suppression was found to be dose-dependent.<sup>180</sup> The aqueous extract, besides having anti-fertility activity, was found to possess anti-estrogenic, anti-progestative, anti-histaminic and anti-acetylcholinic activity. It also raised the blood pressure in anaesthetised dogs and increased the force of myocardial contraction in isolated rabbit heart.<sup>181</sup> The water soluble fraction of the alcoholic extract of the seeds has been reported to have marked transient hypotensive effect in anaesthetised dogs. The extract was found to depress the rate of respiration and relaxed the smooth muscles of the intestines and non-pregnant uterus of rats and rabbits.<sup>182</sup> It also showed spasmodic action on the smooth muscles of the isolated ileum and trachae and on frog's rectus abdominis muscle. These studies revealed the presence of cholinergic and papaverine-like active principles and probably also cardiotonic principle.<sup>183</sup> The

essential oil obtained from the seeds produced a transient fall of arterial blood pressure in anaesthetised dog without affecting the respiration in lower doses.

The oil exerted a direct cardiac depressant action on frog heart and dog heart in the open chest preparation. It also showed marked CNS depressant action in rats and fish. It afforded moderate protection to frogs from the convulsant effect of strychnine and metrazol.<sup>184</sup> In view of the interesting pharmacological activity attributed to extracts of *Daucus carota*, it was of interest to study the chemical constituents of the seeds of this plant. A large number of compounds have previously been isolated from *D.carota*, a list of which is given in Table-VIII.

TABLE-VIII

PLANT	COMPOUNDS	REF.NO.
<i>D. carota</i>	Quinic acid, shikimic acid, uronic acid, tartaric acid, malic acid, citric acid, isocitric, succinic acid, fumaric acid, $\alpha$ -ketoglutaric acid.	185,194
	Kaempferol-3-glucoside, kaempferol-3-diglucoside, apigenin glycoside.	186
	Choline, unidentified quaternary base, n-nonacosane, n-heptacosane.	187
	$\beta$ -Sitosterol, glucose, leucine, valine tyrosine, DL-alanine, glycine, serine.	188
	Phytoene.	189
	$\alpha$ -Terpinene, terpinen-4-ol, $\alpha$ -terpineol bornyl acetate, $\gamma$ -decanolactone, $\beta$ -selinene, $\alpha$ -gurjunene, coumarin.	190
	Arginine, glutamine, aspartic acid, alanine, threonine, pyrrolidone carbonylic acid, galacturonic acid.	191
	Protoalkaloids, pyrrolidine, daucine, 3-methyl-6-methoxy-8-hydroxy-3,4-dihydroisocoumarin.	192

Contd..

<i>D. cárota</i>	$\alpha$ -Humulene, $\beta$ -fornesene, $\gamma$ -bisabolene	195
	Carotol, daucol	196
	Chrysin, apigenin, luteolin, kaempferol, quercetin, apigenin-7-0-glucoside, apigenin-5-0-glucoside, luteolin-7-0-glucoside.	197
	Isoprene, $\beta$ -caryophyllene, linalool acetaldehyde, p-cymene, terpinolene, dipentene, ethanol, camphene, bisabolene, $\beta$ -ionene, 2-nonenal, nonanal, $\alpha$ -pinene, $\gamma$ -terpinene, $\beta$ -pinene, $\alpha$ -terpinol, $\alpha$ -ionone, dodecanal, $\alpha$ -terpinene, nopol, borneol, bornyl acetate, 4-terpineol, biphenyl, myrcene, carotol, ionene.	198
	Cholesterol, sitosterol	199
	Anthocyanins, leucoanthocyanins, flavonols, catechins	200
	Glycine, alanine, serine, tyrosine, valine, leucine	201
	p-Hydroxy benzoic, vanillic, salicylic acid, gentisic acid.	202
	Phospholipids, triglycerides	203
	Ferulic, caffeic, chlorogenic acid	204
	Carotatoxin	205

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## 4.2 RESULTS AND DISCUSSION

### Isolation Studies on Seeds of *Daucus carota*

*Daucus carota* L (Umbelliferae) has been reputed as a medicinal plant in scientific and folkloric literature. In this section of the thesis the isolation of several different compounds from the seeds of *Daucus carota* is presented. As a result of present work seven different compounds have been isolated from the seeds of *Daucus carota*.

The seeds of *Daucus carota* were crushed and extracted with ethyl alcohol. The extracts were concentrated in a cyclone evaporator to a dark brown coloured semi-solid residue. This was extracted with hexane and concentrated to a dark brown oily mass which was chromatographed on a silica gel column. The column was packed in petroleum-ether and eluted with this solvent followed by increasingly polar mixtures of petroleum ether-chloroform, chloroform, chloroform-methanol and finally with methanol.

The petroleum ether-chloroform (80:20) fraction afforded a mixture of three compounds namely compound I, II and III. These compounds were further purified by preparative t.l.c. on silica gel (G-60), benzene: hexane (1:1).

The petroleum ether-chloroform (70:30) fraction afforded a mixture of four different compounds namely IV, V, VI and VIII. These were further purified by preparative t.l.c. on plates of silica gel (G-60) in chloroform. The structures of these compounds are currently under investigation. Some of the spectroscopic data obtained are given in the experimental section.

Isolation Studies on seeds of *Daucus carota*

The seeds of *Daucus carota* (5.0kg) were crushed and soaked in hot ethyl alcohol (10 litre). The extracts was drawn after every fifteen days. After three extractions the extracts were concentrated in a cyclone evaporator under reduced pressure, the temperature being maintained between 50-55°C. A dark brown coloured semi-solid residue (400g) was obtained. This semi-solid residue was extracted with hexane. After three extractions the extracts were concentrated in a cyclone evaporator under reduced pressure, the temperature being maintained between 55-55°C. A dark brown coloured oily mass (100.0g) was thus obtained. The oil (7.0g) was chromatographed on silica gel (280.0g). The column was packed in petroleum-ether and was eluted with petroleum-ether followed by increasingly polar mixtures of petroleum ether-chloroform, chloroform, chloroform-methanol and finally with methanol.

The petroleum ether-chloroform (80:20) fraction afforded a mixture of three compounds, namely compounds I, II and III. These compounds were further purified by

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\* For general notes on experimental, please see page 64.

preparative t.l.c. on silica gel (G 60) plates in benzene-hexane (1:1). The petroleum ether-chloroform (70:30) fraction afforded a mixture of four different compounds namely compound IV, V, VI and VII. These were further purified by preparative t.l.c./<sup>on</sup>chromatography plates of silica gel (G 60) in chloroform. The mass spectra of the compounds are presented below and further work on their structures is under progress:

Comp. I

Mass Spectrum:  $m/e = 310 (M^+, 40\%), 284 (65\%), 265 (100\%), 264 (90\%), 222 (90\%), 179 (63\%), 88 (80\%).$

Comp. II

Mass Spectrum:  $m/e = 368 (M^+, 81\%), 353 (6\%), 338 (5\%), 308 (15\%), 288 (36\%), 177 (70\%), 85 (100\%).$

Comp. III

Mass Spectrum:  $m/e = 426 (M^+, 90\%), 408 (45\%), 299 (60\%), 256 (87\%), 210 (100\%).$

Comp. IV

Mass Spectrum:  $m/e = 238 (M^+, 73\%), 220 (48\%), 194 (90\%), 151 (100\%), 93 (75\%).$

Comp. V

Mass Spectrum:  $m/e = 424 (M^+, 28\%), 423 (70\%), 409 (15\%),$   
 $395 (10\%), 380 (20\%), 298 (65\%), 281 (25\%), 149 (100\%).$

Comp. VI

Mass Spectrum:  $m/e = 282 (M^+, 73\%), 281 (45\%), 262 (80\%),$   
 $255 (100\%), 213 (74\%), 185 (50\%), 97 (89\%).$

Comp. VII

Mass Spectrum:  $m/e = 280 (M^+, 70\%), 263 (60\%), 262 (100\%),$   
 $255 (30\%), 222 (54\%), 180 (45\%).$