CHAPTER V
SUMMARY AND CONCLUSIONS

Agriculture has been the prominent occupation to provide food and fibre to the
growing population of India. Irrigation has been considered essential for the fast growth
in agriculture and it will continue to be a major factor in future too. Today water scarcity
is alarming and there is every reason to be worried about. In many regions water use
has exceeded water availability.

India is the land of spices, is the largest producer, consumer and exporter of
spices in the world. The fennel stands third in production and area among seed spices
and is mainly grown in the states of Gujarat, Rajasthan and to some extent in Uttar
Pradesh, Karnataka, Andhra Pradesh, Punjab and Madhya Pradesh as a cool weather
crop. The majority of farmers in India are irrigating their fennel fields with less efficient
surface irrigation methods. Hence, adoption of micro irrigation technology is needed
not only to reduce the losses of irrigation but also to bring economy in water and input
use.

Drip irrigation is one of the best and latest technology for efficient utilization of
irrigation water. Drip irrigation provides higher water use efficiency, higher crop yield,
less labor requirement and relatively low operating cost, less weed growth, less
insect/pest attacks, shorter growing season and earlier harvest of the crop. More
automation, easy adjustment & control and more area under irrigation is possible in
drip irrigation with mulching as compared to conventional methods. However, the
higher initial cost, lack of sufficient technical knowledge among the farming
community and high maintenance of drip system are the main constrain for its wide
scale adoption. The technical knowledge of how much water to be applied and when to
irrigate the crop are the important for better crop performance and net realization.

For these purpose, an experiment was carried out in winter season of 2016-17
at Instructional Farm, College of Agricultural Engineering and Technology, JAU,
Junagadh. The treatments of the experiments were; three irrigation frequency viz; 2
Day (F₁), 3 Day (F₂), and 5 Day (F₃) as main factor and four irrigation levels viz; 0.4
IW/ETc (I₁), 0.6 IW/ETc (I₂), 0.8 IW/ETc (I₃) and 1.0 IW/ETc (I₄) as sub factor. The
experiment was laid out as per split plot design with three replications of each treatment.
The effect of both irrigation frequency and irrigation levels on growth parameters yield
attribute and yield of fennel was evaluated imparting statistical analysis. These factors
on plant height (30 DAS, 60 DAS, 90 DAS and at harvest stage), umbels per plant, umbellate per umbel, seeds per umbel, test weight, seed yield (kg/ha), biological yield (kg/ha) and Harvest index (HI). The water use parameters were water use efficiency (WUE) and crop water production function were analyzed. Economics was considered in study for assessment of the economic feasibility of the drip system. For that, cost of cultivation, cost of irrigation, gross return, net return and benefit cost ratio (B: C) was computed.

Based on the result analysis, the following conclusions could be drawn.

1. At initial stage of fennel crop the crop coefficient $K_c$ value is high in 2 days frequency while increases with decrease in irrigation frequency. The $K_c$ adjusted is found to be less than $K_c$ FAO for all the stages of fennel crop.

2. The water requirement of the fennel crop more or less similar in all the frequency of irrigation for particular level of irrigation when irrigated up to 120 DAS.

3. Plant growth in terms of plant height at 30 DAS, 60 DAS, 90 DAS and at harvest stage was recorded higher 22.34 cm, 55.16 cm, 171.99 cm and 179.21 cm, respectively, at 2 days frequency and 1.0 IW/ET$_c$ irrigation level treatment combination.

4. In case of yield attributing characters; higher number of umbels per plant (36.67), umbellate per umbels (24.21), and seeds per umbels (509.22) was recorded in treatment combination of $I_2F_1$ (at 2 days frequency and 0.8 IW/ET$_c$) whereas these characters were lowest in treatment combination with less frequency and lower level (at 5 days frequency and 0.4 IW/ET$_c$).

5. Significantly higher number of seeds per umbel (509.22) and test weight of fennel seed (6.00 g) was recorded in treatment combination of $I_2F_1$ (at 2 days frequency and 0.8 IW/ET$_c$) whereas lowest number of seeds per umbels (239 seeds/umbels) and test weight of fennel seed (3.12 g.) was recorded in treatment combination with less frequency and lower level (at 5 days frequency and 0.4 IW/ET$_c$).

6. The treatment combination of (at 2 days frequency and 0.8 IW/ET$_c$) gave significantly higher seed yield of 2287.52 kg/ha than other treatment combinations. The lowest seed yield of 1009.00 kg/ha was found in treatment
combination with less frequency and lower level (at 5 days frequency and 0.4 IW/ETc).

7. The treatment combination of (at 2 days frequency and 1.0 IW/ETc) gave significantly higher biological yield of 12513.21 kg/ha than other treatment combinations. The lowest biological yield of 5176.74 kg/ha was found with less frequency and lower level (at 5 days frequency and 0.4 IW/ETc).

8. The higher harvest index (23.57) was observed in treatment combination of (at 2 days frequency and 0.8 IW/ETc) and lowest (19.97) was observed in found with less frequency and lower level (at 5 days frequency and 0.4 IW/ETc).

9. The treatment combination of (at 2 days frequency and 0.4 IW/ETc) gave higher water use efficiency (10.23 kg/ha-mm) and lowest water use efficiency (3.02 kg/ha-mm) was found with less frequency and lower level (at 5 days frequency and 1.0 IW/ETc).

10. The response of yield to total water applied (crop water production function) could be described using a second order polynomial function with goodness of fit 0.4583, 0.9164 and 0.974 for irrigation frequency 2 days, 3 days and 5 days, respectively. The optimum depth of water input and the maximum yield was obtained as 2 day, 3 day and 5 day was 341.61 mm, 334.50 mm, 427.81 mm and 2099.65 kg/ha 1857.61 kg/ha 1376 kg/ha, respectively.

11. The operating time of pumping set for the 2 day irrigation frequency with 0.8 IW/ETc irrigation level was 46.91 hr during the season.

12. The highest net return was found as 68898.86 ₹/ha with cost benefit ratio of 2.43 under treatment combination of (at 2 days frequency and 0.8 IW/ETc).

The drip irrigation system having 16 mm dripline with 4lph dripper at 0.6 m spacing placed at 0.9 m spacing should be irrigated at 2 days irrigation frequency with 0.8 IW/ETc irrigation level for getting highest seed yield and net return in fennel crop.