MOISTUBE IRRIGATION

Crop growth, yield and water use efficiency

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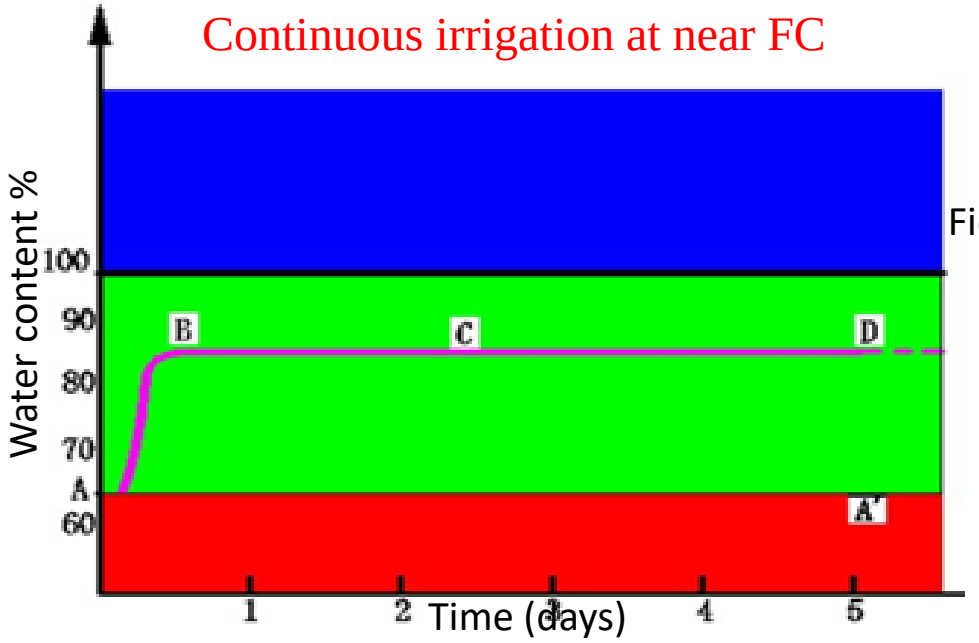
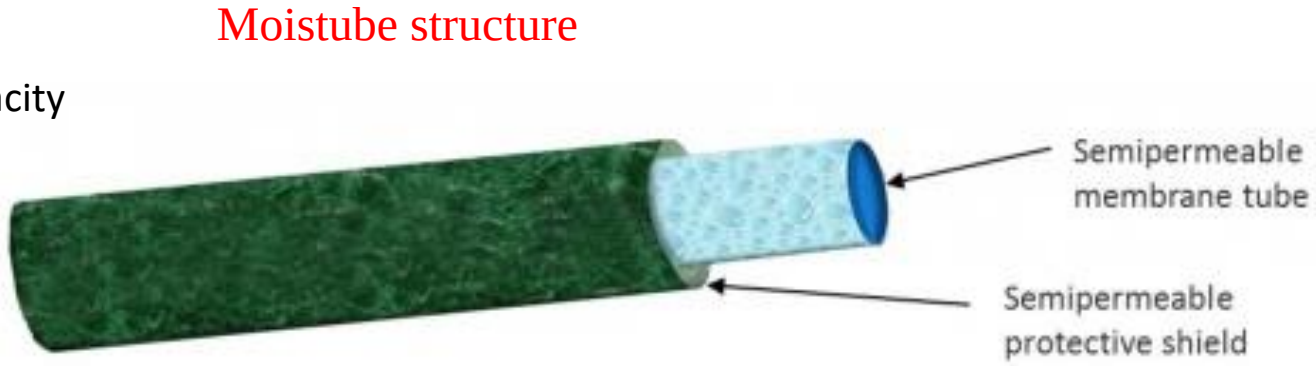
Moistube Irrigation (MTI)

- Moistube irrigation (MTI) is a new technology which originated in China
  - Trials in China, UAE, Morocco (Green Engineering Mission)
- The system uses semi-permeable membrane
- Supplies water at 80 – 90% FC throughout the cropping cycle



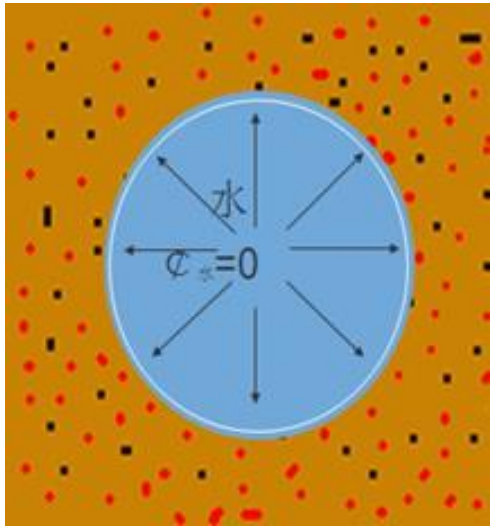


(Envirogrower, 2017; Yang, 2016)

Water flow mechanism

- The discharge from Moistube varies with;

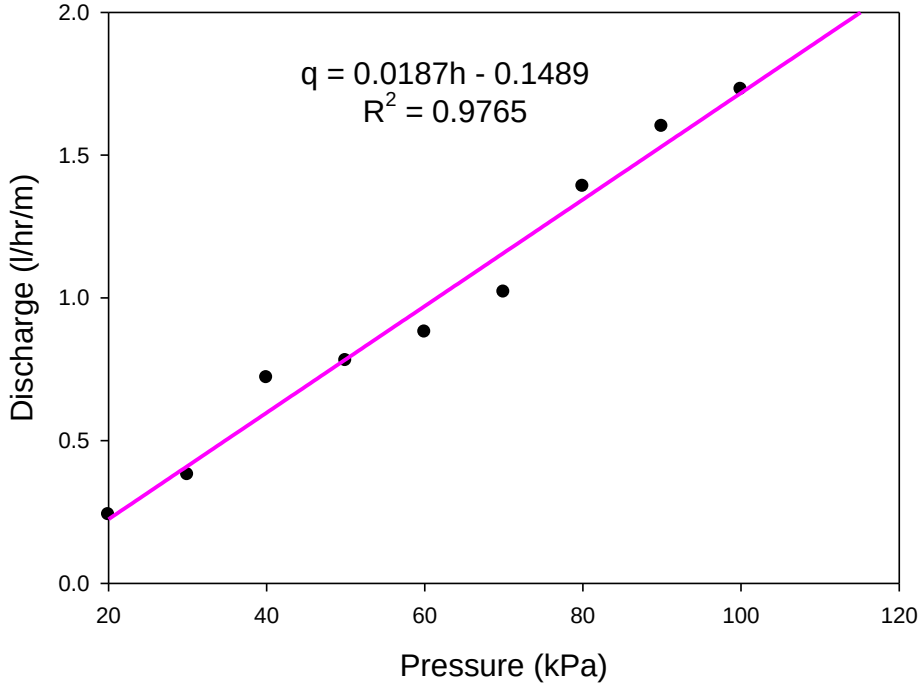
1) System pressure
2) Soil water potential



$\phi_{water} \geq \phi_{soil}$. large volume of water seepage

$\phi_{water} > \phi_{soil}$, less volume of water seepage

$\phi_{water} = \phi_{soil}$, no water seepage



- The effect of soil water potential is weak (< 48 hours)

(Niu, et al., 2013, Yang, 2016, Niu et al., 2017; Kanda, et al., 2018)

Crop performance under MTI

1) Tomato

- Relatively same yield, 38% water savings and WUE (↑13 – 26%), than drip irrigation

2) Cabbage

- No significant improvement in yield compared to drip irrigation
- No improvement in water savings under MTI compared with drip irrigation

Xue, et al., 2013; Lyu, et al., 2016; Zhang, et al., 2017; Sun et al., 2018)

Crop performance under MTI…

3) Black mustard (*Brassica Nigra*)

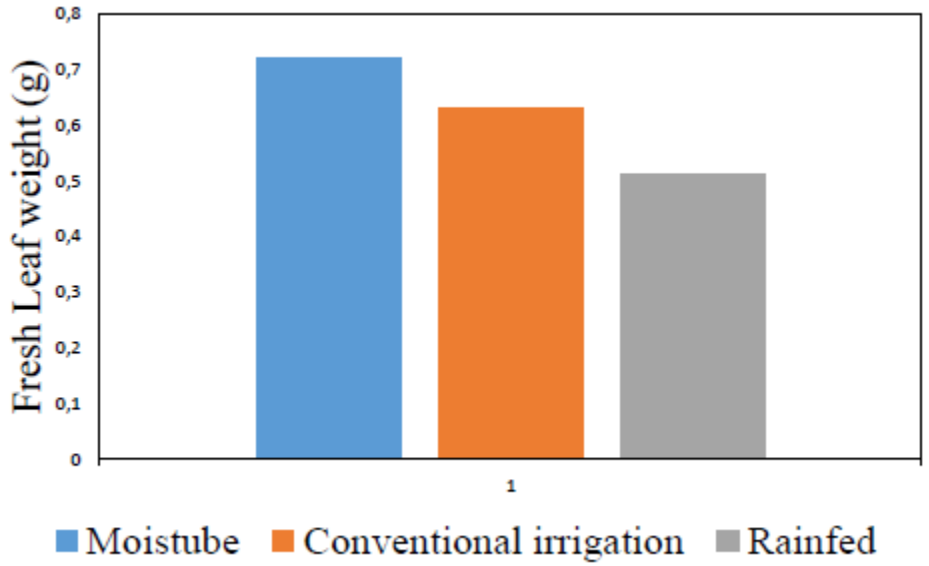
MTI Plant height = 34 cm

Drip Plant height = 23 cm (Yang, 2016)

Crop performance under MTI…

4) Naval oranges

- Highest leaf respiration index, photosynthetic rate, specific leaf weight and quantum yield



(Yao, et al, 2014; Yang, 2016)

Crop performance under MTI…

5) Winter wheat

- Biomass, yield, crop & irrigation WUE ≈ drip irrigation
- Water savings = 25%

6) Maize

- Yield significantly less in MTI than subsurface drip (SDI)
- WUE not significantly different between SDI and MTI

(Zhang, et al., 2018)

Crop performance under MTI…

7) Cowpea

- There was no significant difference ($p > 0.05$) in the leaf area index between MTI and SDI
- Flowering occurred 7 days earlier under MTI than SDI
- Grain yield were not significantly different between SDI (3025 kg ha^{-1}) and MTI (3189 kg ha^{-1})
- MTI had 11.7% higher grain WUE than SDI
- No significant difference in biomass WUE between MTI and SDI at 100%

(Kanda, 2019)

Crop performance under MTI…

8) Sunflower

- WUE was 31% higher under MTI than drip irrigation

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9) Eggplant

- Yield of 212.1 kg/ha and 230.1 kg/ha was achieved for MTI and surface irrigation respectively
- Irrigation water productivity of 23 kg/m^3 and 69.1 kg/m^3 under surface irrigation and MTI respectively

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(Tian et. al, 2016 and Wang, 2016)

Conclusions

- Crop response to water availability under MTI was varied
- Most crops such as tomato, wheat, sunflower responded favourably to water availability under MTI
- WUE was improved under MTI ---due to the deficit irrigation nature of MTI
- Except for tomato, the other experiments were single case study
- Validation studies are required to confirm the water savings (or lack of) in MTI
- Other crops need to be investigated …..
- Currently canola (*Brassica napus* L.) and date palm (*Phoenix dactylifera* L.) are under investigation in South and North Africa, respectively.

Acknowledgements

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Thank You