A V Ramanjaneyulu et al., Agrotechnol 2015, 4:2
http://dx.doi.org/10.4172/2168-9881.S1.015

Trickle irrigation enhances rabi castor yield and water use efficiency

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Castor (*Ricinus communis* L.) is a well known non-edible and industrially highly valued crop. Traditionally different parts of castor plant are being used in various sectors such as domestic, medical, agriculture, industry and of late ornamental. In the recent days, efforts are on for utilization of castor oil in biofuel programmes in different countries. At present it is cultivated in 30 different countries of which India, China, Brazil, Ethiopia and Thailand are the major castor growing ones accounting for about 90% of the worlds' production. India alone produces about 70% of the castor production of the world. Thus, India is the world largest producers of castor seed and meets most of the global demand for castor oil. India accounts for nearly 66.5 and 82.9% of world's castor area and production, respectively. India stands first both in area (1.21 million ha), production (1.76 million tonnes) and productivity (1455 kg ha^{-1}) during 2013-14. In India, castor is grown in 13 states, however, only three states viz. Gujarat (78.3%), Rajasthan (15.6%) and erstwhile Andhra Pradesh (4.73%) together contribute 98.63% of the total production of castor. In South India, castor is mainly grown under rainfed conditions where the crop is severely affected by *Botryotinia gray rot* (BGR). Further, crop is also threatened by mid season or terminal dry spell leading to low productivity of 600-700 kg ha^{-1} which is far less than national average of 1455 kg ha^{-1}. Thus growing castor under rainfed conditions was proved to be not profitable. Castor cultivation during rabi season with limited water is a new dimension where crop will not affected by BGR and also doesn't face moisture stress. However, to circumvent the problems of water and electricity problems, trickle irrigation and fertigation was adopted. Four irrigation levels in main plots (I1: Irrigation @ 0.3 pan evaporation I2: Irrigation @ 0.6 pan evaporation I3: Irrigation @ 0.9 pan evaporation through trickle method and I4: Irrigation @ 75 mm CPE through check basis method) and four N levels (N1: N @ 40 kg ha^{-1} N2: N @ 80 kg ha^{-1} N3: N @ 120 kg ha^{-1} through fertigation and N4: N @ 80 kg ha^{-1} through pocketing) were tried in a split pot design replicated thrice. The experiment was conducted for two consecutive years during rabi 2010-11 and 2011-12 on a red sandy loam soil which was low in N, medium in Phosphorus and high in Potash. The results revealed that scheduling of irrigation through trickle method @ 0.9 pan evaporation resulted in significantly higher seed yield of 2978 kg ha^{-1} as compared to that of 0.6 pan evaporation (2674 kg ha^{-1}) and 0.3 pan evaporation (1852 kg ha^{-1}). Application of N @ 120 kg ha^{-1} through fertigation has recorded seed yield of 2980 kg ha^{-1} which was significantly superior to that of 80 kg N ha^{-1} (2672 kg ha^{-1}) applied through fertigation. The higher yield in these treatments is mainly owing to significantly longer, total and effective no. of spikes and also no. of capsules per spike. Further, 80 kg N ha^{-1} applied through fertigation has significantly outyielded80 kg N ha^{-1} applied through pocketing method (2456 kg ha^{-1}). The seed yield obtained due to application of 40 kg N ha^{-1} through fertigation was found to be inferior to all treatments. Scheduling of irrigation water through trickle irrigation helped to save 30% water vis-à-vis check basin method. However, neither irrigation levels nor fertigation levels influenced the intercepted radiation by the crop canopy. Significantly higher main root area, sub root area and also total root area were found to be with trickle irrigation @ 0.9 pan evaporation and fertigation @ 120 kg N ha^{-1} through fertigation. The total root length was unaffected by irrigation treatments, however, fertigation @ 120 kg and 80 kg N ha^{-1} were found superior to rest of treatments.

Biography

A V Ramanjaneyulu is currently working as Research Scientist at Prof. Jayashankar Telangana State Agricultural University, India.

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