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Effect of irrigation scheduling, mulching and hydrogel on pea

Harinder Singh and Yuvraj Kasa

Abstract
The trial study "Effect of Irrigation scheduling, Mulching and Hydrogel on Pea (*Pisum sativum* L.)" has been carried out at experimental field of Lovely Professional University. The investigation has been done with various treatment mixes of irrigation scheduling, mulching and hydrogel. The impact was seen on plant height, pod length, number of seed/pod and number of pod/plant. The treatment blend of 6 kg mulch and 100 grams of hydrogel showed the critical impact on pea crop. With these blends the normal tallness was recorded (21.5 cm, 48.1cm and 82.4 cm) at 30 DAS, 60 DAS and 90 DAS, the pod length was highest in T9 (10.3) and shortest in T1 (7.3), number of seed/pod was recorded higher in T9 (9.6) as compare to T1 (7.3) similarly number of pod/plant also effected that was greatest in T9 (57) and lowest in T1 (31.6).

Keywords: Hydrogel, irrigation scheduling, pea

Introduction
Garden pea (*Pisum sativum* L.), an individual from the family *Fabaceae*, is one of the main cool season vegetable crop developed all through the world. In India, it is developed over a space of around 3, 14, 000 ha with a yearly creation of 25, 60, 000 tons (Anonymous, 2007-08) [1]. It possesses a place of impressive worth in light of its significance in horticultural economy of the country. Ethiopia is presumably the primary focal point of birthplace of the nursery peas. It is truly agreeable and nutritious for human utilization and is taken new, canned, frozen or in dehydrated form. It contains higher extent of absorbable proteins along with starches, nutrients and mineral matter. Green delicate foliage of nursery pea is likewise utilized as vegetable in pieces of Asia and Africa. Leaves are utilized as a pot herb in Myanmar and parts of Africa (Kay, 1979) [6]. Nursery pea is a cool season crop and is mainly grown in Uttar Pradesh, Bihar, Haryana, Himachal Pradesh and Punjab. However, Uttar Pradesh represents 70% of the absolute output of peas in India (Singhal, 2003) [11].

Water is an important natural asset and its proficient administration is a key to accomplishment in success crop production. During the 21st century, water would be an urgent factor in improving food creation, in gathering food shortage experienced by very nearly 66% of the total populace since flooded cultivating is relied upon to keep on growing seriously in future (UNESCO, 2000) [14]. Sensible administration of irrigation water resources is not only significant for improving and supporting the sustainable agriculture as well as for prevention of saltiness, alkalinity, water logging and degradation of environment. For farmers with a limited stock of water, improving profitability is an opportunity to improve earnings and livelihoods (Sharma, 2002) [12]. Irrigation system being a scant and monetarily significant expense input, particularly in hilly regions, its optimality in pea development is vital to understand the greatest yield just as improve the water use proficiency. The sharp fall in groundwater levels inferable from excessive evacuation for farming and different uses combined with the important expenses of fuel and electrical energy utilized for pulling out groundwater and poor water use efficiency because of inefficient practices are influencing the economics of water use in all circles of human action. So we need to improve effectiveness and efficiency of water utilized in horticulture to guarantee reasonable creation of food and fiber.

Hydrogel is three-dimensional, hydrophilic polymer, freely cross-connected network equipped for assimilating a lot of water or natural liquids. These manufactured polymers found in the form of crystal and accessible under a few trademarks *viz.*, Super Absorbent, Pusa Hydrogel and so forth are all in all called hydrogel. Hydrogels have extraordinary potential in zones where opportunity for water system is limited and can build the water accessibility during crop production. The limit of the hydrogel to ingest and hold water is just about as much as 80-180

times its unique volume (Bowman *et al*., 1991) [4] while on weight basis it can retain as high as 400 times its unique weight (Kalhapure *et al*., 2016) [7]. It upgrades the harvest profitability per unit available water and supplements, especially in humidity stress condition. Grain yield, supplement take-up and water use effectiveness improved in winter pea when hydrogel was applied at the pace of 5kg/ha in sandy loam soil (Tyagi *et al*., 2015) [13], while in a mud soil with a similar portion of hydrogel application alongside suggested portion of manure 8.48% expansion in yield was noticed (Borivoj *et al*., 2006) [3]. Hydrogel lessens the filtering of herbicide, compost and requirement of water for crops. It additionally advances early thick blossoming and tillering and postpone the permanent wilting point (Mehr and Kourosh, 2008) [8].

Mulching is very effective in expanding yield and improving crop production by adjusting soil temperature and controlling soil moisture by decreasing water lose from the soil by dissipation. Mulch can work with compost position and diminish the deficiency of plant supplements through draining. Mulches can likewise give an obstruction to soil microbes. (Poli and Geven 1996) revealed that mulches altogether diminished the incidence of *Phytophthora poori* in leeks. Mulching with aluminum coloured polyethylene created a setback for the invasion rate of *Benisia tabaci* in tomato and as an outcome, a delay of contamination of tomato yellow leafcurl virus (TYLCV) (Mauromicale *et al*, 1996) [9]. Hazy mulches prevent the germination of some yearly weeds by removing daylight and air (Bonanno, 1996) [2], while reflective mulches repulse certain insects (Castellone *et al*, 1995). Mulches keep the fruit off the soil, and the outcome is cleaner produce that requires less consideration during evaluating, packing and handling. Mulches have a several benefits over herbicides and growth of plant. Herbicides regularly are poisonous and require cautious and timely application. On inadequately depleted soil mulch preserve moisture and lessening soil disintegration and supplement draining.

Material and Methods

The current experiment entitled "Impact of Irrigation scheduling, Mulching and Hydrogel on Pea (*Pisum sativum* L.)" was completed during Rabi period of 2020-21 at lovely professional university central zone of the state. The detail of the materials utilized and procedures embraced over the span of experimentation have been described in this part under following heads;

The soil of the test site is loamy soil. It is the important, productive and profitable soil group of the state Punjab. The field is located at in lovely professional university central zone of the state. This zone gets precipitation from both south-west and north-west monsoon which is all around appropriated from June to September. Impact of three unique levels like 25 gm., 50 gm. and 100 gm. for each plot of hydrogels were tried on Pea crop. The impact of hydrogel was seen on various plant development attribute of Pea. A rectangular plot had been chosen for the crop production. The land was first furrowed by tractor utilizing a moldboard plough. At that point the huge hunks were broken by a cultivator and been harrowed once to get a fine slant. Edges, bunds, water system channel were prepared and the land was adequate for raising the crop. The variety of seed which is utilized is NP-11. The seeds were sown 3 to 4 inches in the soil. Seed rate used 4kg in 400m2 plot.

The suggested dose of supplements (N, P, K 45:155:0 kg/ha) were applied as urea, di-ammonium phosphate. The accessible quantity of nitrogen in DAP was deducted from the portion of Urea. A big part of the nitrogen was applied at planting time as basal portion alongside the full amounts of phosphorus and remaining half portion of nitrogen was applied as top dress before the second irrigation.

Hydrogel was combined in with soil and applied during the hour of irrigation in band of the seed line with the treatments of hydrogel at the dose of 2.5, 5 and 7.5 kg/ha. At the point when the hydrogel is applied into the soil it helps to hold huge amounts of water and deliver retained water gradually to the plant.

Mulching was included in separate treatments with rice straw at the rate of 4 and 6 t/ha on 2-3 DAS with in the inter line space. Mulch was kept up to the harvest of the crop.

Irrigation was given at critical development stages. Measure of irrigation water was applied to the plots according to the treatments at the depth of 5cm. The source of irrigation water was ground water with great and low quality water system water.

Treatments

T1 = 25 grams hydrogel and no mulch, T2 = 25 grams hydrogel and 4kg mulch, T3 = 25 grams hydrogel and 6 kg mulch, T4 = 50 grams hydrogel and no mulch, T5 = 50 grams hydrogel and 4 kg mulch, T6 = 50 grams hydrogel and 6 kg mulch, T7 = 100 gram hydrogel and no mulch, T8 = 100 gram hydrogel and 4 kg mulch, T9 = 100 gram hydrogel and 6 kg mulch.

Result and Discussion

Increase in growth parameters at higher moisture control may be because of support of sufficient and ceaseless moisture to plant which maintain great establishment of roots and different metabolic cycles. The increment in CGR and leaf area index and leaf may be because of actuality that adequate accessibility of moisture expanded the absorption of nutrients and brought higher number of green leaves with expanded size which prompted higher plant height, number of pod and size of pod of pea.

Plant height

Records of the average height as affected by various treatments at 30 DAS, 60 DAS, and 90 DAS are presented in table 1, and graphically represented in fig 1. Data exposes that plant height was significantly affected due to different levels of hydrogel and straw mulch.

Table 1 covers that plant height was noticed most extreme (30.6 cm, 48.0 cm and 78.0cm at 30 DAS, 60 DAS and 90 DAS) in treatment T9 and least (12.0 cm, 40.0 and 70.0 cm) in T1. There was small difference between T9 (100 g hydrogel and 6 kg mulch) and T6 (4 kg mulch and 50 g hydrogel) as the quantity of mulch is same and quantity of hydrogel is different. Same case is seen in T4 and T1 as the quantity of hydrogel is unique and there is no mulching. The plant tallness is noticed less in T1, it very well may be because of the low concentration of hydrogel and no mulching on the plot. This encourages less take-up of nourishment in the plant.

Because of the low concentration of hydrogel, the soil didn't consumed water as much as different plots and surprisingly no mulching influenced the soil productivity. Subsequently T1 values are less because of no use of mulch and low amount of hydrogel however T9 values are higher as the quantity of hydrogel was 100 grams and applied mulch sum was 6 kg. Enlargement in plant tallness at higher humidity is because of maintenance of sufficient and consistent moisture to plant which kept up the great establishment of roots and different metabolic cycles.

Table 1: Effect of treatments on plant height of pea

Treatment	30 DAS	60 DAS	90 DAS
T1	12.0	40.0	70.0
T2	12.6	41.0	71.0
T3	16.3	40.3	72.6
T4	16.0	43.6	72.0
T5	21.0	43.0	72.3
T6	20.6	41.0	69.3
T7	27.0	43.0	73.6
T8	29.0	45.6	76.0
T9	30.6	48.0	78.0
F test	S	S	S
C.D	2.781	2.826	3.207
SE (m)	0.920	0.935	1.061

*S = Significant

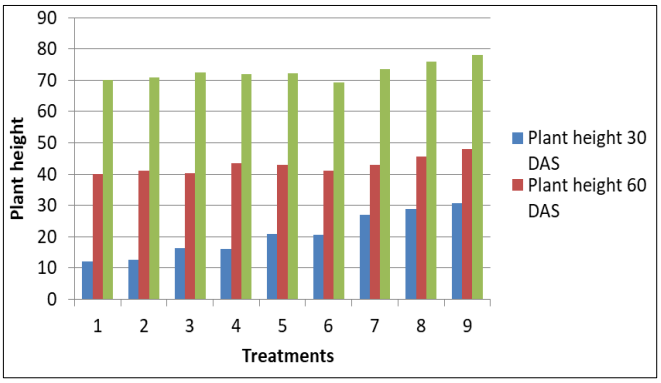

Fig 1: Effect of treatments on plant height of pea

Pod length

Data on the mean number of pod per plant of pea as affected by several treatments are presented at the table 2, and graphically represented in fig 2.

Table 2 shows that pod length was highest in T9 (10.3) and lowest in T1 (7.3). Since the amount of mulch is the same but the amount of hydrogel is different, there was a minor difference between T9 (100 g hydrogel and 6 kg mulch) and T6 (4kg mulch and 50 g hydrogel). T4 and T1 have the same challenge because the volume of hydrogel is different and there is no mulching. Because of the low concentration of hydrogel and the lack of mulching on the plot, pod length is found to be lower in T1. As a result, the plant absorbs less nutrients. As a result, T1 values are lower due to the lack of mulch and low concentration of hydrogel, but T9 values are higher because the hydrogel concentration was 100 grammes and the volume of mulch added was 6 kg. The maintenance of sufficient and continuous moisture to the plant, which preserved the good establishment of roots and various metabolic processes, resulted in an increase in pod length at higher moisture regimes.

Table 2: Effect of treatments on pod length of pea

Treatment	Pod length
T1	7.3
T2	8.0
T3	7.6
T4	8.0
T5	8.0
T6	9.3
T7	9.0
T8	10.0
T9	10.3
F test	S
SE (m)	0.475
C.D	1.435

*S = Significant

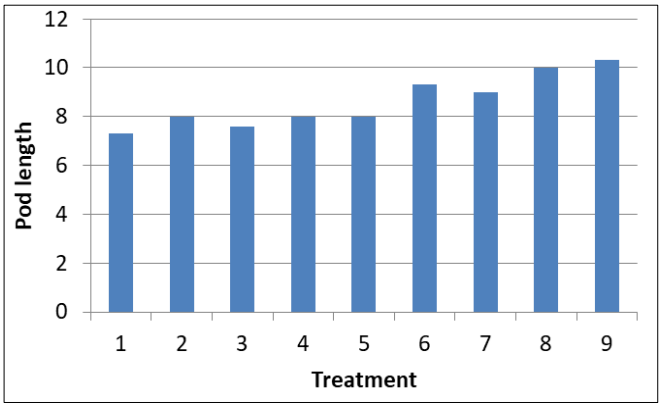

Fig 2: Effect of treatments on pod length of pea

Number of seed/pod

Data on the mean number of seed/pod of pea as affected by several treatments are presented at the table 3, and graphically represented in fig 3.

Table 3 shows that the number of seed/pod was highest in treatment T9 (9.6) and lowest in T1 (7.3). There was a minor difference between T8 and T9 because the hydrogel concentration was the same in both, but the amount of mulching applied was different. T4 and T7 and T1 had the same situation as T1 because there was no mulch applied, but the concentration of hydrogel was different. T1 had fewer seed/pod, which may be due to the low concentration of hydrogel and the absence of mulches. Mulching increases soil fertility, while hydrogel helps to prevent nutrients from leaching. As a result of the lack of mulches and the use of a low-concentration hydrogel, T1 values are lower. In T9, the amount of hydrogel used was 100 grammes, and the amount of mulch used was 6 kilogrammes.

Table 3: Effect of treatments on number of seed/pod of pea

Treatment	No. of seed/pod
T1	7.3
T2	7.0
T3	7.6
T4	8.0
T5	7.0
T6	7.3
T7	9.0
T8	9.3
T9	9.6
F test	S
C.D at 5%	1.312
SE (m)	0.434

*S = Significant

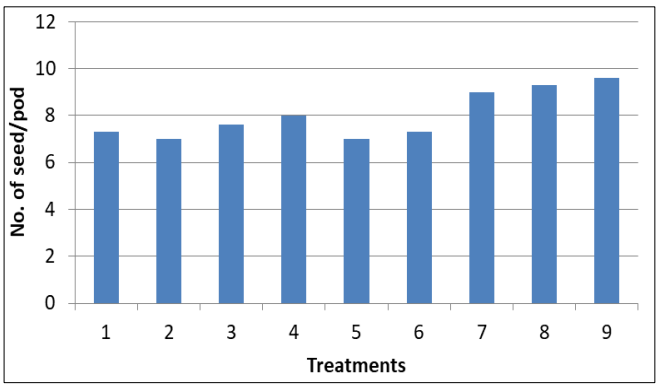

Fig 3: Effect of treatments on number of seed/pod of pea

Number of pod/plant

The effect of hydrogel and mulch on number of pods/plant was significant. Data on the mean number of pod per plant of pea as affected by several treatments are presented at the table 4, and graphically represented in fig 4.

Table 4 covers that, number of pods was noticed most (57.0) in treatment T9 and least (31.6) in T1. There was micro difference in T8 and T9 as the amount of hydrogel is same in the two of them while amount of mulching application was unique. Same case was seen in T4 and T7 and T1 as there were no use of mulch except for the amount of hydrogel was different. Number of pods was noticed less in T1, it very well may be because of low amount of hydrogel and no use of mulches. As mulching assists with increasing fertility of the soil and hydrogel assists with catching the supplements from the leaching. Thus T1 esteems are less because of no utilization of mulches and use of hydrogel in low concentration. And higher in T9 as the amount of hydrogel applied was 100 grams and mulches applied was 6 kg.

Table 4: Effect of treatments on number of pod/plant of pea

Treatment	No. of pod/plant
T1	31.6
T2	32.6
T3	36.0
T4	39.3
T5	38.0
T6	43.0
T7	42.3
T8	52.3
T9	57.0
F test	S
C.D	3.098
SE (m)	1.024

*S = Significant

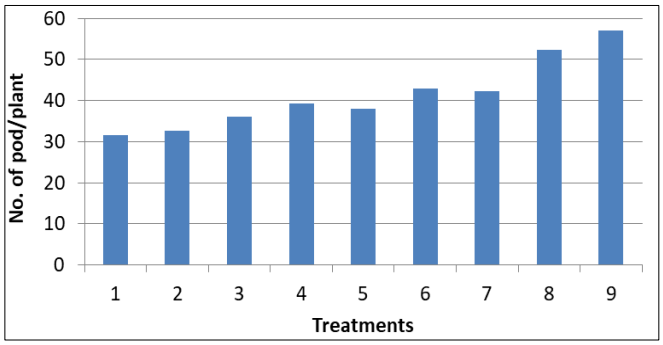

Fig 4: Effect of treatments on number of pod/plant of pea

Conclusion

Hydrogel shows an expanding capability of at least 400 times, frequently surpassing multiple times of its weight in pure water. Quite, its expanding proportion expanded with the increment in temperature up to 500 °C with no unfavorable impact on the polymer network structure. It builds the harvest efficiency per unit accessible water and supplements, especially in humidity stress condition. It improves actual properties of the soil, seed germination, seedling rise rate, root development and thickness that help plants to delayed moisture stress. Mulching is end up being valuable in saving of humidity and expanding efficiency of pea. Straw mulch additionally gives advantage as far as expanding infiltration rate, brings down the temperature improve accessibility of manure and increase crop yield.

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