RESEARCH ARTICLE

The Effect of Deproteinised Juice (DPJ) on Seed Germination and Seedling Growth of Different Plants (by Paper Towel Method)

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ABSTRACT

The deproteinised juice (DPJ) is also referred as 'Whey' or 'Liquor' which is left after the extraction of protein from juice. It contains proximate amount of non protein nitrogen, soluble carbohydrates, calcium and potassium as suggested by Reddy (1986). The DPJ can be used as a fertilizer for seed germination and growth of plants.During the present investigation some wild and cultivated plant species(*Brassica juncea, Goniocaulonindicum, Celosia argentea, Digeramuricata*and *Tridax procumbens*) have been used for the preparation of deproteinised juice (DPJ) and the effect of these DPJ has been studied on the seed germination and on growth of Pigeon pea seedling.

Key words:-Deproteinised Juice (DPJ), Seed Germination, Plant growth, Seedling Growth, fertilizer etc.

INTRODUCTION

The technique for extraction of protein from green leaves has been suggested by Pirie (1942) now becoming popular as "Green Crop Fractionation" (GCF). The process of GCF consists of pulping the green material, expressing the juice and precipitating the proteins by heat. Thus the process of GCF results into four fractions, namely Leaf juice (Leaf extract), Pressed crop residue (PC), Leafproteinconcentrate (LPC) and Deproteinised juice (DPJ).

The DPJ is the fourth and last product of green crop fractionation process. During preparation of LPC, the LPC can be separated from remaining part of the juice i.e. deprotenised juice (DPJ), by filtration through a simple cotton or canvas cloth. The DPJ is a by-product of GCF system, which is produced in large volume. This brown colored watery juice is "Whey" or "Liquor."

In order to avoid environmental bio-pollution due to the random disposal of DPJ and to make the process of GCF more economical and efficient, its proper use has to be made (Pirie, 1942). It is well known that, the DPJ contains biologically active substances like sugars, carbohydrates, free amino acids, amides, minerals, vitamins and other water soluble components. The dry matter of the DPJ contains 40% carbohydrates and 3% nitrogen as reported by Pirie (1971).

The glucose and fructose are the dominant monosaccharide present in the DPJ. Various workers suggested the use of DPJ as a fertilizer or manure for germination and growth of plants (Dakore, 1985; Ajaykumar and Mungikar, 1990a). In the present investigation attempts were made to study the effect of different DPJ (*Brassica juncea, Goniocaulonindicum, Celosia argentea, Digeramuricata*and *Tridax procumbens*) at various concentrations (0.5%, 1.0%, 1.5%, 2.0% and 2.5%) on seed germination and growth of Pigeon pea (*Pisum sativum*) seedling.

MATERIAL AND METHODS

Preparation of DPJ solution

The different concentrations of deproteinised juice solution (0.5%, 1.0%, 1.5%, 2.0% and 2.5%) were prepared by dissolving 0.5g to 2.5g of dry DPJ in 100ml distilled water. The DPJ solutions were filtered and used.

The seeds under investigation i.e. Pigeon pea seeds were soaked in distilled water and in various concentration of DPJ solution ranging from 0.5% to 2.5% for 24 hours. The seeds were removed, washed with distilled water and surface sterilized with 0.1% mercuric chloride solution for one min., washed several times with sterilized water. The germinating blotting papers were rinsed with 0.01N HCl and washed with distilled water. The seeds were kept for germination on germinating blotting paper. Ten seeds were replaced on the paper; the paper was then folded and replaced in a beaker containing water to provide adequate moisture for germination. Three replicates of each treatment were taken for the study. After 7 days, the resulting seedlings were taken for observation viz. shoot length, root length, fresh wt. and dry wt. per seedling.

RESULT AND DISCUSSION

The results obtained during the course of investigation were presented in different tables.The data obtained were statistically analyzed for standard deviation and analysis of variance (ANOVA) following Gomez & Gomez (1976) and Mungikar (2003).

The DPJ from *Brassica juncea* significantly enhanced the germination of Pigeon pea in 1.5% concentration, whereas *Goniocaulonindicum, Digeramuricata* and *Tridax procumbens* significantly enhanced the germination in 0.5% and 1.5% concentration.

Table 1. Effect of different DPJ on germination (%) of Pigeon pea seed.

Name of DPJ	Concentration of DPJ (%)						C.D.(5%)	C.V.(%)	S.E.
	Control	0.5	1.0	1.5	2.0	2.5			
Brassica juncea	76.7	63.3	40.0	86.7	36.7	63.3	8.36	7.11	2.51
Goniocaulonindicum	80.0	100.0	100.0	63.3	80.0	86.7	13.59	8.32	4.08
Celosia argentea	86.7	60.0	67.5	73.3	30.0	35.0	8.54	6.98	2.56
Digeramuricata	96.7	100.0	90.0	50.0	63.3	93.3	11.10	7.07	3.33
Tridax procumbens	80.0	83.3	96.7	90.0	80.0	86.7	10.33	6.24	3.10

Table 2.Effect of different DPJ on Shoot length (cm) of Pigeon pea.

Name of DPJ	Concentration of DPJ (%)						C.D.(5%)	C.V.(%)	S.E.
	Control	0.5	1.0	1.5	2.0	2.5			
Brassica juncea	5.25	8.59	5.43	5.79	6.44	4.57	0.47	4.10	0.14
Goniocaulonindicum	9.14	12.11	10.48	11.67	7.86	7.31	1.10	5.88	0.33
Celosia argentea	13.51	7.78	7.27	7.00	5.48	6.08	1.03	6.83	0.31
Digeramuricata	7.55	8.49	7.59	6.88	4.74	7.19	1.28	9.44	0.39
Tridax procumbens	8.14	9.32	9.97	7.53	8.37	6.85	1.54	9.59	0.46

Table 3.Effect of different DPJ on Root length (cm) of Pigeon pea.

Name of DPJ	Concentration of DPJ (%)						C.D.(5%)	C.V.(%)	S.E.
	Control	0.5	1.0	1.5	2.0	2.5			
Brassica juncea	4.02	6.05	4.99	5.94	6.60	7.43	0.11	1.02	0.03
Goniocaulonindicum	8.11	9.79	10.52	7.17	7.90	7.47	1.08	6.62	0.32
Celosia argentea	9.08	7.24	7.88	7.50	4.26	5.01	1.47	11.20	0.44
Digeramuricata	3.97	8.10	7.93	7.18	6.52	6.61	1.27	9.86	0.38
Tridax procumbens	4.87	8.60	8.63	7.22	6.22	7.46	0.49	3.55	0.15

Table 4. Effect of different DPJ on fresh wt. (gm) of Pigeon pea seedling

Name of DPJ	Concentration of DPJ (%)						C.D.(5%)	C.V.(%)	S.E.
	Control	0.5	1.0	1.5	2.0	2.5			
Brassica juncea	0.30	0.36	0.34	0.25	0.28	0.30	0.04	6.07	0.011
Goniocaulonindicum	0.28	0.27	0.27	0.19	0.22	0.28	0.03	5.91	0.009
Celosia argentea	0.34	0.37	0.38	0.39	0.22	0.29	0.01	2.18	0.004
Digeramuricata	0.30	0.32	0.34	0.33	0.25	0.28	0.01	1.16	0.002
Tridax procumbens	0.31	0.36	0.41	0.34	0.42	0.39	0.01	1.70	0.004

Table 5. Effect of different DPJ on dry wt. (gm) of Pigeon pea seedling

Name of DPJ	Concentration of DPJ (%)						C.D.(5%)	C.V.(%)	S.E.
	Control	0.5	1.0	1.5	2.0	2.5			
Brassica juncea	0.069	0.079	0.082	0.078	0.071	0.081	0.003	1.75	0.001
Goniocaulonindicum	0.097	0.107	0.121	0.082	0.095	0.078	0.024	12.94	0.007
Celosia argentea	0.091	0.091	0.094	0.093	0.059	0.062	0.007	4.69	0.002
Digeramuricata	0.082	0.10	0.10	0.10	0.08	0.08	0.004	2.37	0.001
Tridax procumbens	0.080	0.10	0.111	0.085	0.096	0.080	0.002	1.39	0.001

C.D. = Critical difference, C.V. = Coefficient of variation, S.E. = Standard error.

However, the DPJ from *Celosia argentea* completely inhibited the germination even at lower concentration (Table 1). The increase in shoot length was observed at 0.5% concentration in Pigeon pea with the DPJ of *Brassica juncea, Goniocaulonindicum* and *Digeramuricata* whereas *Tridax procumbens* DPJ showed stimulation in 1.5% concentration (Table no. 2). The increasing trend for root length was observed in Pigeon pea with the DPJ of *Brassica juncea* in concentrations ranging from 0.5% to 2.5%, whereas

DPJ of *Digeramuricata, Goniocaulonindicum* and *Tridax procumbens* showed increased in root length at 0.5% and 1.5% concentrations (Table no. 3).

The increase in weight of fresh seedling of Pigeon pea was found with *Brassica juncea* DPJ in the concentration of 0.5% and 1.0%. The DPJ of *Celosia argentea* and *Digeramuricata* showed increasing trend for fresh weight seedling with the concentration ranging from 0.5% to 1.5% whereas *Tridax procumbens* DPJ showed increasing trend from 0.5% to 2.5% concentration. However, *Goniocaulonindicum* DPJ had no effect on weight of fresh seedling (Table 4). The increasing trend for dry weight seedling of Pigeon pea was observed with *Brassica juncea* DPJ from 0.5% to 2.5% concentration whereas other DPJ showed the increase in 0.5% and 1.0% concentration (Table 5).

Maindarkar and Mungikar (1994) reported that lucerne DPJ inhibited the seed germination at higher concentration however; lower concentration did not affect the germination. Maindarkar (1990) studied the effect of DPJ on germination of maize,wheat, sorghum and mungseed and she reported that at higher concentration the DPJ inhibited the germination of seed by reducing the growth of root as well as shoot. It indicates that the inhibition of germination was depended on nature of the seeds, concentration of the DPJ used in the studies and on the species from which it was extracted.

CONCLUSION

In the present investigation lower concentration of DPJ always gave positive results on seed germination and seedling growth however, the higher concentrations have lethal for all the parameters which have been studied.

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