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Effect of diseases and insect-pests on forage quality of cowpea

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*Corresponding author e-mail: dk_banyal@yahoo.com**Keywords:** Cowpea, Diseases, Forage quality, Insect-pests, *Vigna unguiculata*

Introduction

Cowpea (*Vigna unguiculata*) an important forage legume is mainly cultivated in tropical and sub-tropical regions of India for its food and fodder value. It is highly nutritive with 23.0, 67.0, 1.8 per cent protein, carbohydrate and fats respectively, and is also a rich source of calcium and iron. Cowpea is also prone to a number of diseases and insect-pests causing great losses in yield and quality of green fodder. High incidence of diseases profoundly reduces yield and quality, whereas insects typically reduce yield more than quality. Cowpea is grown globally in an area of 14 million hectares with an annual production of 4.5 million tonnes. In India, it is cultivated in an area of 1.5 million hectares with annual production of 0.5 million tonnes (Reddy, 2006). In Himachal Pradesh, cowpea is either taken as sole crop or intercropped with maize mainly as *Kharif* crop in low lying and mid hill areas of state., Wet and humid environmental conditions during the cropping season predispose the crop to the attack of various fungal pathogens and insects pests which cause substantial yield losses.

Materials and Methods

Survey of cowpea insect-pests and diseases: Systematic survey was carried out in farmers fields for recording the incidence of insect-pests and diseases during the *Kharif* seasons of 2011 and 2012.

Management of cowpea pests: An experiment was conducted under protected and unprotected conditions during *kharif* seasons of 2011-12 to study the relationship of incidence of different diseases on the quality of their fodder. The crop was protected with seed treatment with imidacloprid 70 WS @ 5g/kg seed + carbendazim @ 2 g/kg seed followed by foliar sprays of imidacloprid 17.8 SL @ 0.3ml/l at 15 days interval were undertaken for the management of insects and alternate foliar spray of mancozeb and metalaxyl + mancozeb @ 2.5g/l at 10 and 15 days interval were undertaken for the management of diseases.

Forage quality parameters: Important forage quality parameters *i.e.*, DM, CP%, NDF%, ADF%, hemicelluloses % , Chl a (mg/g), Chl b (mg/g), total Chl (mg/g), ash%, K(ppm), Ca (ppm), IVDMD%, ADF-N (CP %), CHO (g/100g) and Phenolics (g/100g) were determined in unprotected as well as protected crop using standard procedures after 30 and 60 days of sowing.

Results and Discussion

The data in table 1 revealed 46.0, 27.5, 21.0, 16.5 and 15 per cent incidence/severity of wilt and root rot, leaf spot, Phytophthora blight, anthracnose and yellow mosaic virus (YMV). The data in table 2a revealed that in unprotected crop showed high wilt and root rot incidence (14.5-37.2 %), leaf blight severity (15.8-44.7 %) and YMV incidence (1.9-10.3 %). Under protected conditions, the incidence of these diseases varied from 8.3-21.8 %, 6.0-19.9 % and 0.6-3.0 % respectively. The number of sucking pests were also more (0.6-5.2 insects/leaf) in unprotected as compared to protected conditions (0.2-2.9 insects/leaf). Yield increased by 16.5 per cent in protected crop (60.2 q/ha) as compared to unprotected crop (51.7 q/ha).

There was significant increase in DM% (dry matter), CP % (crude protein), chlorophyll a, b and total (mg/g), ash %, K (ppm) and Ca (ppm), IVDMD % (*in vitro* dry matter digestibility) and CHO (g/100g) in protected crop as compared to unprotected crop in 30 as well as 60 days after sowing. The NDF % (neutral detergent fiber), ADF % (acid detergent fiber), hemicellulose %, ADF-N (CP %) and phenolics (g/100g) were observed less in protected crop as compared to the unprotected crop. In 60 days old crop, DM, NDF, ADF and phenolics were higher as compared to 30 day old crop in both protected as well as unprotected crop. However, other parameters were higher in 60 days old crop as compared to 30 days old crop (Table 2b). In the protected crop, DM and CP increased from 37.8 to 38.5 and 15.3 to 15.66 per cent and NDF and ADF decreased from 63.21 to 61.78 and 55.32 to 53.53 per cent as compared to unprotected crop after 60 days of

sowing, respectively. Chlorophyll contents (a, b and total) were high in protected crop (0.442, 0.353 and 0.795mg/g) as compared to unprotected crop (0.430, 0.288 and 0.718 mg/g) respectively, after 60 days of sowing. In the sample drawn from the 60 days old crop, it was observed that ash (4.02%), K (132.1 ppm), Ca (269.2 ppm), IVDMD (62.32 %) and CHO (3.97 g/100g) were more in protected crop in comparison to 3.97 per cent, 116.7 ppm, 258.8 ppm, 60.98 per cent and 3.37 g/100g, in 30 day old crop, respectively. The data on quality parameters clearly revealed that incidence of diseases and insects-pests is directly correlated with the yield and forage quality. Buxton and Fales (1994) have reported earlier that diseased plants typically have lower digestibility and nonstructural carbohydrate concentration than healthy plants. Moreover, diseases often cause leaf loss, which has an adverse effect on forage quality. Edwards *et al.*, (1981) observed that stem rust, reduced digestibility of orchard grass. Gross *et al.*, (1975) found that digestibility of smooth bromegrass decreased 12 percentage units for each 1 per cent increase in diseased area of leaves. Hutchins *et al.*, (1989) found digestibility of alfalfa stems and leaves from stunted plants to be slightly higher than control plants that had not undergone potato leafhopper injury.

Table 1: Survey of Cowpea diseases and insects-pests

Diseases and insect-pests	Per cent incidence/severity		
	2011	2012	Average
Wilt/root rot	45	47	46.0
Leaf spot and blight	25	30	27.5
Phytophthora blight	12	30	21.0
Anthraxnose	15	18	16.5
CMV	20	10	15.0
Pod borer	10	7	8.5

Table 2a: Effect of plant protection on severity /incidence of diseases and insect-pests and green fodder yield

Treatment	Year	Incidence (%)			No. of sucking pests /leaf	Yield (q/ha)
		Wilt/root rot	Leaf blight	YMV		
Un-protected crop						
30 days crop	2011	7.7	12.0	1.0	0.5	-
	2012	21.4	19.6	2.8	0.7	
	Av.	14.5	15.8	1.9	0.6	
60 days crop	2011	32.7	43.3	10.7	5.7	53.4
	2012	41.7	46.0	9.8	4.6	49.9
	Av.	37.2	44.7	10.3	5.1	51.6
Protected crop						
30 days crop	2011	6.0	5.0	0.2	0.2	-
	2012	10.6	6.9	1.1	0.3	
	Av.	8.3	6.0	0.6	0.2	
60 days crop	2011	26.7	19.7	2.9	3.6	60.1
	2012	16.8	20.1	3.0	2.1	60.3
	Av.	21.8	19.9	3.0	2.9	60.2

Table 2b. Effect of management of diseases and insect-pests on the forage quality of cowpea

Treatment	Quality characters														
	DM	CP %	NDF %	ADF %	Hemi cellulose %	Chl a(mg/g)	Chl b(mg/g)	Total Chl(mg/g)	Ash %	K (ppm)	Ca (ppm)	IVDMD %	ADF-N (CP%)	CHO (g/100g)	Phenolics (g/100g)
Un-protected															
30 days crop	31.1	19.53	60.56	51.65	8.92	0.401	0.351	0.737	4.47	158.5	318.3	64.23	5.23	4.13	0.47
60 days crop	37.8	15.30	63.21	55.32	7.90	0.430	0.288	0.718	3.97	116.7	252.8	60.98	5.96	3.37	0.59
Protected															
30 days crop	31.7	20.41	58.70	50.45	8.42	0.493	0.362	0.858	4.61	162.4	290.9	66.58	4.34	4.40	0.40
60 days crop	38.5	18.66	61.78	53.53	8.20	0.442	0.353	0.795	4.02	132.1	269.4	62.36	5.67	3.97	0.50

Conclusion

The pest free condition leads to increase in green fodder yield by 16.5 per cent. It was observed that these pests in addition to reducing the yield also decrease the quality of the fodder. In protected crop, the desirable quality parameters increased as compared to unprotected crop. Hence, the management of diseases and insect-pests is of paramount importance not only for the increasing the yield, but also for the production of quality fodder.

References

- Buxton, D. R. and S. L. Fales. 1994. Plant environment and quality. In: G. C. Fahey, Jr. M. Collines, D. R. Moertens and L.E. Moser (Eds). *Forage quality, evaluation, and utilization*, American Society of Agronomy, Madison, WI, USA. pp. 155-199.
- Edwards, M. T., D. A. Sleper and W.Q. Loegering. 1981. Histology of healthy and diseased orchard grass leaves subjected to digestion in rumen fluid. *Crop Sci.* 21:341–343.
- Gross, D. F., C. J. Mankin and J. G. Ross. 1975. Effect of diseases on *in vitro* digestibility of smooth bromegrass. *Crop Sci.* 15:273-275.
- Hutchins, S. H., D. R. Buxton and L. P. Pedigo. 1989. Potato leaf hopper – induced injury on growth and development of alfalfa. *Crop Sci.* 29:1541-1545.
- Reddy, S. R. 2006. *Agronomy of field crops*. Kalyan Publishers. 2nd revised edition 365-367