STUDIES ON INDUCTION OF SEED DORMANCY IN GREEN GRAM (*Vigna radiata* L. Wilczek)

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By

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CERTIFICATE

This is to certify that the thesis entitled “STUDIES ON INDUCTION OF SEED DORMANCY IN GREEN GRAM (*Vigna radiata* L. Wilczek)" submitted by Miss SNEHA M. MENEDAL for the degree of MASTER OF SCIENCE (AGRICULTURE) in SEED SCIENCE AND TECHNOLOGY, to the University of Agricultural Sciences, Dharwad is a record of research work carried out by her during the period of her study in this University, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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1. INTRODUCTION

Pulse crop plays an important role in Indian agriculture. India is the largest producer and consumer of pulses in the world. Pulses contain a high percentage of quality protein nearly three times as much as cereals (Upadhayay *et al.*, 1999). Thus, they are cheaper source to overcome protein malnutrition among the human beings. For vegetarian diet, pulses form the major source of protein. In fact lysine is the most limiting essential amino acid in cereals which is very well supplemented by the protein of pulses. The pulses are known to improve the physical characteristics of soil and their ability to use atmospheric nitrogen through biological nitrogen fixation promotes sustainable agriculture. In addition, it also provides nutritious fodder and feed for live stock. Pulse crops are drought resistant and prevent soil erosion due to their deep tap root system and good ground cover, because of these good characters, pulses are called as “Marvel of Nature”.

Green gram (*Vigna radiata* L. Wilczek 2n =22) is one of the most ancient and extensively grown leguminous crops of India. According to Vavilov (1926) it is a native of India and Central Asia. It is a short duration crop, rich in protein and vitamin B. In India it is cultivated in Maharashtra, Andhra Pradesh, Rajasthan, Orissa and Karnataka. It can be grown under wide range of soils. It is grown usually as rainfed crop and can also be grown as pre- monsoon, late monsoon and spring crop. In India it occupies 3.44 million ha area with a production of 1.88 million tonnes and average productivity of 526 kg per ha (Anon., 2013). Whereas, in Karnataka it occupies an area of about 2.86 lakh ha with a production of about 0.67 lakh tonnes with an average productivity of 237 kg per ha (Anon., 2013) which is less than the national average productivity.

Green gram is highly digestible, high in protein (22 - 24%) and does not cause flatulence that many other legumes do. Moreover, it is rich in vitamins such as A, B, C, niacin and minerals such as potassium, phosphorus and calcium, which are

necessary for human body. Owing to all these characteristics it is a good substitute of animal protein and forms a balanced diet when it is taken along with cereals.

Seedlings are the most sensitive stage in a plant's life cycle especially to environmental conditions. The ambient temperature during period of soil water availability is known to be an important cause for seed germination and the interaction effects of temperature and moisture availability at seed germination substantially contribute to promoting germination during conditions that enhance the survival of the seedling stage.

Vivipary, also refers to *in situ* germination of seeds while still developing on the mother plant. It manifests an uninterrupted progression of development from embryogenesis to germination without an intervening period of maturation marked by events like desiccation, storage of reserves, quiescence and dormancy. The pre-harvest sprouting of the greengram causes considerable loss due to sprouting of seeds in pods in the fields. Pre-harvest sprouting would imply germination of well developed physiologically mature seeds prior to their harvest. This situation occurs under excess moisture conditions caused by extended and frequent rains, heavy dew, high humidity and even low temperature .For greengram cultivation in summer season where the rains are invariably received and cause heavy losses of produce by way of sprouting of pods in the field. It is more problematic in soil areas where moisture retention capacity is high. Germination is the first hurdle of the plant life cycle. This seed to seedling transition is regulated by many factors, including light, moisture, temperature, oxygen and the seed dormancy state and the influence of external chemicals. Genotypes that produce non dormant seeds at harvest may already be able to germinate to some degree even before harvest. The main problem related to an early loss of dormancy in crop species is pre harvest sprouting. This phenomenon is a characteristic of cereal species, like rice, barley, wheat, and sorghum. As these species all exhibit intraspecific variability for the rate of dormancy loss and pre harvest

sprouting behaviour, genotypes with contrasting sprouting behaviour have proved useful for many comparative studies (Biddulph *et al*., 2008 in wheat and Steinbach *et al*., 1995 in sorghum) , in addition to QTL analysis to identify several loci related to dormancy (Gao *et al*., 2008 in rice , Kumar *et al.,* 2009 in bread wheat and Lohwasser *et al*., 2005 in wheat) . When low levels of dormancy during late grain maturation period are combined with rainy or damp conditions in the field, the process of germination is activated while the seeds are still attached to the mother plant, and the resulting emergence of the radicle from the seed coats is called pre harvest sprouting. Depending on the intended purpose for the seeds after harvest, pre harvest sprouting can have serious negative consequences on seed quality.

Pre-harvest loss is a problem in many parts of the world, pre-harvest losses occurs in 3–4 years out of 10. Total worldwide annual losses have been estimated to about US$1 billion, but precise statistics are lacking. Direct economic losses caused by pre-harvest losses to producers occur in several ways: desiccation of a sprouted grain leads to its subsequent loss of viability because, together with the activation of metabolism implicated in embryo growth, tolerance to dehydration is lost rendering the sprouted grain useless for sowing or malting. Sprouting also promotes carbohydrate respiration that not only reduces grain yield, but also creates a favourable environment for the attack of grains by saprophytic fungi and bacteria that produce toxins. The occurrence of pre-harvest losses not only depends on morphological and physiological traits genetically controlled (such as infructescence structure and permeability of structures surrounding the seeds and seed dormancy), but also depends on environmental factors (water availability and temperature). A single genotype may express pre-harvest losses when grown in some areas, but not in others.

Seed dormancy indicates the inability of the seeds to germinate even under favourable conditions. It is fairly obvious that more than one cause might be

responsible for the dormancy of a seed. In a broad view, two types of dormancy can be distinguished i.e. (1) "Innate' dormancy where the seeds will not germinate even under favourable conditions and (2) Imposed dormancy where seeds will not germinate when conditions are un favourable. Several forms of innate dormancy have been recognized. Seeds may fail to germinate because of impermeable seed coat to water .Dormancy and germination are traits that are controlled in a highly complex manner involving one or a combination of morphology, physiology and physical structures (Baskin and Baskin, 2001; Finch-Savage and Leubner-Metzger, 2006). Dormancy can be beneficial when it prevents mature seeds from sprouting before harvest. Resistance to pre harvest sprouting depends on factors influencing water uptake and drying rate of the grain, seed dormancy, and the remobilization of nutrients to support germination. These factors are controlled by a number of genes that strongly interact with environmental conditions. Seed dormancy is the main heritable factor that contributes to pre harvest sprouting resistance, but the many attempts to control it through breeding programs have shown that dormancy is tightly linked to other interesting traits. In addition to classical breeding techniques, elucidation of the mechanisms involved in the control of dormancy may open other possibilities for manipulation of dormancy So, the search for investigation of non-conventional methods of inducing dormancy in green gram to save the produce and to retain the seed quality against the field sprouting are of greater importance. There are some chemicals which are capable of altering the seed dormancy. Among those, treatment with foliar application of Maleic Hydrazide at 1000,2000 and 3000ppm Paclobutrazol at 100,200 and 300ppm and PEG-6000 at 18 and 26% at different stages(flowering and pod initiation) of crop growth will induce the seed dormancy in greengram. These are the growth inhibitors that have been successfully used to control sprouting of tubers, roots and bulbs during storage. The main purpose in the use of growth regulators is to control some aspects of germination and growth,

regulate the balance between source and sink, which is the final analysis results in the higher seed yield of desired product.

Keeping all this in view, an attempt has been made to study the feasibility of inducing seed dormancy with various concentrations of Maleic Hydrazide, Paclobutrazol and PEG 6000 in three green gram genotypes *viz.,* DGG -1, DGGV-2 and Selection 4, the present investigation "Studies on induction of seed dormancy in Greengram (*Vigna radiata* L. Wilczek)'' was undertaken with the following objectives.

i. To induce seed dormancy through foliar application of dormancy inducing chemicals in green gram genotypes
ii. To know the effect of foliar spray of dormancy inducing chemicals in green gram during the storage.
iii. Effect of different concentration of dormancy inducing chemicals by seed treatment of green gram genotypes during storage

2. REVIEW OF LITERATURE

Green gram (*Vigna raiata* L,) is an important pulse crop, several reasons could be described to its low productivity of which nearly 20 percent loss in the field is by *in situ* germination due to lack of dormancy (Anonymous ,1979). Hence, there is a need to identify sources with certain period of dormancy to minimize yield losses due to *in situ* germination (Ashokkumar, 1989 and Patil *et al.,* 1991).

The review of literature pertaining to the aspects of induction of seed dormancy in green gram is very meagre. However, an attempt has been made to review the available literature on green gram and other crops in this aspect and the same is presented in this chapter.

2.1 Effect of Maleic hydrazide on seed yield and quality parameters

Maleic hydrazide (diethanolamine salt of 1,2-dihydroxy-3,6 pyridazine-dione), a growth inhibitor has been successfully used to induce dormancy and thus to reduce sprouting losses in potato, sugarbeat ,onion, carrot and rice (Wittwer and Paterson, 1952, Swarnalata *et al*., 2008).

Hansen (1949) stated that pre-harvest foliar spray of maleic hydrazide at 2500 ppm concentration was effective in reducing sprout growth in sugar beet.

Wittwer and Hansen (1951) found that maleic hydrazide was uniformly effective as a growth inhibitor both for dicotyledonous and monocotyledonous plant. Pre-harvest foliar application of maleic hydrazide was found to be effective in reducing the storage losses in sugarbeat

Zukel (1950) reported that a single foliar spray of 2500 ppm maleic hydrazide was effective in inducing dormancy in potato tubers.

Erickson and Price (1950) studied some effects of maleic hydrazide on sugar beet plants and revealed that concentration of 1.0 % maleic hydrazide permanently inhibited top growth with the result that most of the plants died within 4 months.

Paterson *et al.* (1951) reported the effect of maleic hydrazide on sprout inhibition and storage quality of potatoes and results showed that pre harvest spray of maleic hydrazide induced inhibition of sprouting and greatly reduced the storage loss

Rao and Wittwer (1955) have successfully used maleic hydrazide as pre-harvest foliar spray on potato to prevent sprouting of tubers in the field before harvest.

Wittwer and Paterson (1952) have suggested the use of 500ppm maleic hydrazide to induce dormancy in carrot and onion as 2500ppm did not reduce sprouting significantly than 500ppm concentrations.

Paterson *et al.* (1952) revealed that a concentration of 500 or 1000 ppm maleic hydrazide was sufficient to reduce the sprouts in Irish cobbler and Pontiac varieties of potato. But spraying maleic hydrazide at higher concentration (2500 ppm) induced prolonged dormancy (four to seven weeks). Thus, they had suggested that any degree of dormancy could induce with the adjustment in spraying time and concentration of the chemical.

Appalanaidu and Murthy (1961) reported that the percentage of germination in ragi was reduced when maleic hydrazide sprayed to the crop at the rate of 5 and 10 lb per acre after 30 and 45 days of sowing respectively.

According to Randhawa and Nandpuri (1966) the lower concentration of maleic hydrazide was less effective than higher concentration in reducing the sprouts in onion bulbs during the storage. They have noticed maximum dormancy in onion when maleic hydrazide was sprayed with 1000 ppm prior to harvest.

Krishnamurthy (1969) conducted the pot culture experiment and revealed that foliar spray of 500 ppm maleic hydrazide at 15 and 25 days prior to harvest induced dormancy in two varieties of bunch groundnut (Spanish improved and TMV-2). The number of sprouts reduced from 13.3 to 1.8 in Spanish improved and 17.5 to 5.8 in TMV-2. In a field trial he observed the induction of dormancy in Spanish improved

with 200, 400and 600 ppm concentrations of maleic hydrazide sprayed at 75, 81 and 106 days after sowing. Sprouting was 10.3, 12.7 and 10.5 per cent due to 200, 400 and 600 ppm concentrations, respectively as compared to that of un sprayed control (25.6 %). On the basis of this, he recommended to use 200 ppm as the higher concentrations further did not induce dormancy appreciably.

Karivaratharaju and Rao (1972) suggested the use of maleic hydrazide -30 for pre-harvest foliar application to reduce the losses due to viviparous germination in rice as the harvesting period coincides with rainy season in coastal regions

Vaithialingam and Rao (1973) reported that induction of dormancy in TMV-2 bunch groundnut by the foliar application of maleic hydrazide, in a field trial conducted at Coimbatore.

Nagarjun and Radder (1983) observed that foliar spray of maleic hydrazide after 60 days of sowing was found to be superior in inducing seed dormancy compared to later stages of maleic hydrazide application (75and 90 days of crop growth). The concentrations ranging from 250 to 1000 ppm remarkably enhanced the seed dormancy to the extent of 60-80 per cent. However, application of maleic hydrazide in lower concentrations (250 ppm) but at an early stage of crop growth (60 days) was found to be as good as that of higher concentrations in inducing seed dormancy.

Gupta *et al*. (1985) reported, the induction of dormancy in bunch type of groundnut variety T-64 by the foliar spray of maleic hydrazide in the field trials conducted at Allahabad.

Abrar and Jadhav (1991) reported that the seed dormancy period was increased from 5 to 25 days in cv. PI-139915 and PI-169292 by 200 ppm maleic hydrazide applied as foliar spray one month before harvesting.

Pandey *et al.* (1994) studied the effect of maleic hydrazide alone and in combination with fungicides, on post harvest losses in storage of rainy season onion. In India huge losses occur in storage due to sprouting and decay. Experiments showed that the use of maleic hydrazide reduced the losses due to sprouting, however, at higher doses decay increased.

Talukdar and Paswan (1998) reported pronounced growth inhibition and suppression of apical dominance with the application of maleic hydrazide in *Chrysanthemum.* 250 ppm maleic hydrazide was found effective in increasing number of flowers and duration of flowering and 700 ppm was found effective in controlling the plant height and increasing number of branches per plant in the Balsam (Kumar and Kumar, 2004)

Jagatap (2000) studied the induction of seed dormancy in bunch groundnut genotypes viz., RHRG-12,TAG-24,RHRG-16 and SB-XI. He revealed that seed dormancy could be induced upto 30,10,30,20 days respectively by foliar application of maleic hydrazide @ 250ppm than other concentrations of maleic hydrazide applied 500 and 750ppm. He also noticed that reduction in seedling vigour and seeding dry weight due to dormancy induction. The 100 kernal weight (g) was increased and seed viability remains unaffected due to maleic hydrazide spray @ 250,500,750ppm in all the genotypes.

Mukeshumar *et al.* (2000) studied the storage behavior of N-53 in response to preharvest foliar spray of maleic hydrazide @1000, 2000 and 3000ppm concentration 15 days before harvest. They opined that reduced rotting maintained a higher percent of healthy bulbs, higher dry matter, TSS and moisture content compare to control.

Nautiyal (2004) conducted an experiment at NRC , Junagarh in groundnut cultivars using foliar spray of maleic hydrazide at various concentrations and reported that foliar spray of maleic hydrazide @1000ppm ,60days after crop

emergence was found to be superior in inducing dormancy in Spanish groundnut cultivars.

Marek *et al*. (2008) revealed that application of maleic hydrazide on onion decreased storage losses caused by sprouting and rooting of bulbs. This resulted also on decreasing of natural weight losses of onion.

Patil *et al*. (2008) reported that seed treatment with maleic hydrazide at 20 ppm, 40 ppm and 80 ppm of maleic acid in okra seeds exhibited significantly maximum number in respect of number of branches and number of leaves per plant at maleic hydrazide 80ppm number over remaining all other treatments.

Swarnalata *et al*. (2008) studied the variation in seedling growth inhibition due to maleic hydrazide treatment of rice (*Oryza sativa*) and ragi (*Eleusine coracana*) genotypes and its relationship with yield and adaptability and showed that rice genotype were soaked in 10 ml of 500 ppm maleic hydrazide solution for 24 hours and ragi in 3.5 ml of 100 ppm maleic hydrazide solution resulted significant differences in percent reduction of root and shoot length in both.

Navale *et al*. (2010) reported that the effect of plant growth regulators on growth, flowering and yield of chrysanthemum cv. 'IIHR-6'. The results revealed that plant sprayed with maleic hydrazide at 1250 mg/l recorded the maximum reduction in plant height with maximum number of branches, plant spread, shelf life and vase life of flowers, whereas it was also found beneficial for delaying and increasing the duration of flowering. However, in case of flower yield per plant and per hectare, the lower concentration of maleic hydrazide at 750 mg/l was found significantly superior as compared to other treatment.

Sumit *et al*. (2012) conducted an experiment on Paclobutrazol treatment as a potential strategy for higher seed and oil yield in field-grown *Camelina sativa* L. Crantz with five different PBZ treatments (Control: T0; 25 mg/l: T1; 50 mg/l: T2; 75

mg/l: T3; 100 mg/l: T4; 125 mg/l: T5) were applied (soil application) at the time of initiation of flowering. and concluded that PBZ at 100 mg/l concentration (T4) resulted in the highest seed and oil yield by 80% and 15%, respectively.

Sudha *et al.* (2013) reported induction of dormancy in non-dormant varieties of groundnut by maleic hydrazide spray at 500, 750,1000 and 1250ppm and the results showed that treatment with 1250ppm gave lower germination percentage and same spray at 60 and 90 DAS protected the pod from in-situ germination in the field itself

Mukesh *et al*. (2014) showed foliar application of maleic hydrazide with ethephon each at 100 ppm, proved the best for increasing fruit yield and its contributing parameters of Cucumber (*Cucumis sativus* L.).

Sarkar *et al*. (2014) revealed that plant growth retardant maleic hydrazide at 60ppm decreased plant height and increased number of leaves, branches ,flowers(33%) and fruits(35%) per plant and also increased individual fruit weight and yield of tomato per ha about 32 and 57% respectively but it did not affect the fruit length and diameter.

Yoga *et al.* (2014) reported that effect of different growth retardant viz. maleic hydrazide at 5000,10000 and 15000ppm, CCC at 1000, 2000 and 3000ppm and ABA at 250 and 500ppm on inducing dormancy in non dormant groundnut (cv.TMV-7) resulted that ABA at 500ppm at 70 DAS was effective in inducing dormancy and gave the lowest in-situ germination of pods.

2.2 Effect of Paclobutrazol on seed yield and quality parameters

Mage and Powell (1990) studied Inhibition of stratification and germination of apple seeds by paclobutrazol and reported that paclobutrazol (PBZ) (1×10^{-5} to 2.5×10^{-5} M) was inhibitory to germination when added during stratification and/or germination of apple seeds.

Rahul *et al*. (1991) studied the effects of paclobutrazol applied at different Cacao seedling at 30 and 60ppm and concluded that the best responses in terms of height decrease was found with the application of 60ppm.

Anwar (1994) studied Induction of dormancy in nondormant seeds 'Mesa 659' lettuce seeds at 25□ C and result showed that paclobutrazol at 10 to 100 mM was more effective in inhibiting germination in darkness than in light.

Manivannan *et al*.(2008) conducted an experiment to estimate the stress ameliorating ability of paclobutrazol, a triazole fungicide in *Vigna unguiculata* (L.)Walp. Plants treated with 80mM NaCl + 15mg l^{-1} paclobutrazol increased the root and stem length, total leaf area, fresh weight (FW), dry weight (DW) parameters to a larger extent when compared to NaCl stressed plants.

Arup *et al*.(2009) investigated that paclobutrazol arrests vegetative growth and unveils unexpressed yield potential of *Jatropha curcas*. Paclobutrazol treatments were applied [paclobutrazol 23% w/w SC (25% w/v), product of Syngenta Ltd., UK] at 0, 0.75, 1.00, 1.25, or 1.50 g a.i. (active ingredient) m-1 and application of paclobutrazol, an unexpected increase in seed yield, as high as 11-27% relative to controls, was obtained from one such unproductive Jatropha germplasm.

Bekheta *et al*.(2009) studied the physiological response of mung bean (*Vigna radiata*) plants by paclobutrazol (PZ) at 20,100 and 150mg/l and concluded that foliar application of PZ at 150mg/l significantly increased the number of branches per plant , fresh and dry wei ght of leaves ,fresh and dry weight of branches and yield but it significantly decreased the plant height.

Hampton (2011) studied the effect of paclobutrazol on inflorescence production and seed yield in four white clover (*Trifolium repens* L.) cultivars and concluded that November application of paclobutrazol increased seed yield in all four

cultivars ,seeds per inflorescence where as 1000 seed weight did not differ between the treatments .

Dwivedi *et al.(*2012) conducted an experiment on combined effect of cytokinin, paclobutrazol and Ascorbic acid on nitrogen metabolism and yield of wheat (*Triticum aestivum* l.) under water deficit stress condition. Yield related traits also showed significant reduction under water stress condition, while combined application of cytokinin, paclobutrazol and ascorbic acid enhanced the yield and its components.

Babul *et al*. (2012) investigated the vegetative growth, harvesting time, yield and quality of mango (*Mangifera indica* l.) As influenced by soil drench application of paclobutrazol at 2500, 5000, 7500, 10000 ppm and concluded that the application of paclobutrazol at 7500 ppm in october enhanced yield and quality in mango

Niveditha *et al*. (2012) studied the effect of paclobutrazol at 10μgl^{-1} on the growth and pigment variation in *solanum trilobatum* and results were found to have more whole plant fresh weight, dry weight, root length and stem length .

Abolfazl *et al*. (2013) conducted the experiment on role of paclobutrazol on vegetative and sexual growth of apple plants at 500ppm and it caused decreased of vegetative growth and increased of yield and signification effects of fruit quality.

Mohsen (2013) reported response of cucumber plants to foliar application of calcium chloride and paclobutrazol and results showed that application of paclobutrazol significantly influenced the plant height and dry weight .Application of higher concentration of PBZ (10mg/l) reduced the plant height and dry weight (2.54) as compared to control.

Elanchezhian *et al*. (2014) suggested that impact of paclobutrazol at 100mg/ l on yield parameters under submergence stress in rice ultimately contributed to maintenance of crop yield.

Hua *et al*. (2014) carried out an experiment on paclobutrazol application effects on plant height, seed yield and carbohydrate metabolism in canola and results showed that the appropriate time of paclobutrazol application can reduce canola plant height. paclobutrazol applied at stalk heights of 10, 20, 30, 40 and 50 cm. Plants without paclobutrazol application were taken as control. The results indicated that the plant height was reduced by 27% with paclobutrazol applied at 10 cm stalk height as compared with the control. The seed yield was significantly improved by mean increment of 21%.

Pushpendrakumar *et al*. (2015) conducted an field experiment to know the effect of paclobutrazol 40SC 60ml/ha, 75ml/ha, 90ml/ha, 150ml/ha, 300ml/ha, paclobutrazol 23SC 105.6ml/ha, 132ml/ha on growth, physiological mechanism and yield of pigeonpea [*cajanus cajan*] and concluded that a wide variability in phenological developments physiological parameters, growth parameter and morpho-physiological structural components of yield and seed yield of pigeonpea. Various treatments of paclobutrazol significantly affected the phenological development physiological parameters, growth parameter and yield attributing traits and grain yield.

2.3 Effect of polyethylene glycol on seed yield and quality parameters

Lawlor (1970) in his study on absorption of polyethylene glycols by plants and their effects on plant growth .PEG of higher molecular weight 1000 or 4000 considered to cause desiccation of the plant.

Anwar *et al*. (1980) reported on induction of secondry dormancy in chenopodium seeds by osmotic and high temperature treatments and its prevention by light and growth regulator and said when chilled seeds were held in dark in -8.6 bars PEG 6000 solution at 15˚C or in water 29˚C a secondary dormancy was induced.

Kathiresan *et al.* (1984) noticed that soaking of sunflower seeds in water for 12 hours followed by drying increased germination percentage, vigour index and seedling dry weight under water stress condition created by using PEG-6000.

Pieterse (2001) focused on the effect of various pre-treatments on soybean seed performance in soybean seed (cv. Dumela) were subjected to pre-treatments involving poly-ethylene glycol (PEG 6000) at four levels of PEG osmotic potentials of 0, -0.4, -0.6 and –0.8 bar were used .PEG pre-treatment increased the total germination percentage of the low quality seed.

Rosner and Harrington (2004) studied the effect of stratification in polyethylene glycol solutions on germination of three North American shrub species . Incubation of PEG at concentration is necessary to suppress the germination during stratification ranging from no reduction of germination of *Amelanchier alnifolia* to a large reduction in germination of *Shepherdia* c*anadensis*

Dursun and Ekinci (2010) investigated The effects of different priming treatments and priming durations on germination percentage at different temperatures in parsley seeds The seeds were treated for 2, 4, 6 and 8 days with the PEG 6000 (-0.5 MPa, -1.0 MPa and -1.5 MPa), germination studies were made at 5, 10, 15, 20 and 25Â°C the highest germination percentage with priming was determined at 10Â°C. It may be said that seed priming treatments increased seed germination percentage at both low and high temperatures.

Hossein *et al.* (2011) showed the effects of seed osmopriming on seed germination behavior and vigor of soybean (*Glycine max* L.) at -0.4, -0.8, -1.2, -1.6 and-2 MPa and had significant effect on germination percentage.

Adele (2013) reported the effect of PEG induced drought stress on seed germination of lentil genotypes. The seeds placed in petriplates at 10, 15, 18, and 21%

of PEG (MW6000) had lower activity of the enzymes involved in the germination process decreased in all cultivars.

Furong and Jinxin (2013) in their study on effect of seed priming with PEG-6000 on the resistance of *Amorpha fruticosa* L. seeds to lead stress pointed out that polyethylene glycol (PEG) could increase the resistance to lead stress, seeds of *Amorpha fruticosa* were primed by soaking in solutions containing 0, 10, 20, or 30% (w/v) PEG-6000, and half of them were re-dried. The seeds of pretreatment were then germinated on filter paper moistened with solutions containing 0, 300, 500, or 1000 mg/l Pb. Seeds primed in 10% PEG-6000 had the highest germination rates when lead concentrations were ≤500 mg/l, while primed in 20% PEG-6000 had the highest germination when lead concentrations were 1000 mg/l. Root length, shoot length, and fresh weight of *A. fruticosa* seedlings were greatest in the 20% PEG-6000 treatment

Tabatabaei (2013) in his study on drought stress at osmotic potentials of 0 (as control), -4, -8, -12 and -16 bar were adjusted using PEG 6000 and found that After 7 days our results showed that, seed priming treatments significantly ($p \leq 0.01$) affected germination percentage, normal seedling percentage, and germination index. Seed priming with PEG increased germination characteristics as the compared to the unprimed in barley seeds.

Zhihui *et al.* (2014) reported the effects of PEG at −0.45, −0.90, −1.34, −1.79, and −2.24MPa on the seed germination of sunflower (*Helianthus annuus* L.) and concluded that PEG inhibited germination.

3. MATERIAL AND METHODS

The field experiment was conducted to study the seed dormancy induction in green gram genotypes during *kharif* 2013-14 at MULLaRP Scheme, University of Agricultural Sciences, Dharwad .Storage studies were carried out in the seed research Laboratory of National Seed Project, Dharwad, Karnataka. The details of the materials used and techniques adopted during the course of investigation of both field and laboratory experiment is described in this chapter.

3.1 General description

3.1.1 Experimental site

The experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka) in plot number 148 of 'F' block situated at 15°26' N latitude, 75°01' E longitude and at an altitude of 678 m above mean sea level. The Research Station comes under Northern Transition Zone (Zone-8) of Karnataka which lies between the Western Hilly Zone (Zone 9) and Northern Dry Zone (Zone-3).(fig.2)

3.1.2 Climatic conditions

The Data on weather parameters *viz*., rainfall (mm), mean maximum and minimum temperature (^{o}C) and relative humidity (%) recorded at Meteorological Observatory, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during the experimental year,2014 and the mean of the last 62 years (1950-2013) are presented in Table 1(fig.1).

The annual rainfall received during 2014 was 540.1 mm distributed in 47 rainy days. The rainfall during cropping period (June-October) was 424.4 mm which was distributed during crop growth period. It was 24 percent lesser than the normal rainfall (713.8 mm). The rainfall received in the period of first fort night of June to second fort night of July ensured adequate stored moisture for germination, emergence and

Table 1. Monthly meteorological data during crop growth period (2014-15) and the average of 62 years (1950-2013) at the Main Agriculture Research Station, Dharwad

Month	Rainfall (mm)		Rainy days (2014)	Mean Temperature (^{o}C)				Relative humidity (%)	
				Maximum		Minimum			
	2014	1950-2013		2014	1950-2013	2014	1950-2013	2014	1950-2013
January	0.00	0.79	-	29.5	28.74	14.7	14.10	53	64.00
February	0.00	11.16	-	31.0	31.61	16.1	16.5	45	54.35
March	11.40	2.13	1	34.3	34.90	18.6	19.59	42	63.65
April	44.90	48.10	3	36.3	36.60	21.0	20.10	49	77.28
May	197.40	21.33	7	37.8	35.20	21.1	21.34	61	75.17
June	29.30	104.93	4	29.9	30.16	21.6	22.01	89	86.03
July	242.20	153.48	17	27.0	27.27	21.0	20.89	84	89.09
August	158.40	100.74	19	27.0	27.29	20.4	20.09	84	88.44
September	100.20	107.61	8	28.0	27.90	20.2	20.31	81	86.41
October	103.40	124.52	7	30.0	29.49	19.0	18.61	71	79.15
November	48.80	31.63	2	29.0	28.90	15.5	15.89	59	73.25
December	26.20	5.02	1	27.8	27.81	14.5	13.39	64	68.65
Total	962.20	711.44	69	-	-	-	-	-	-

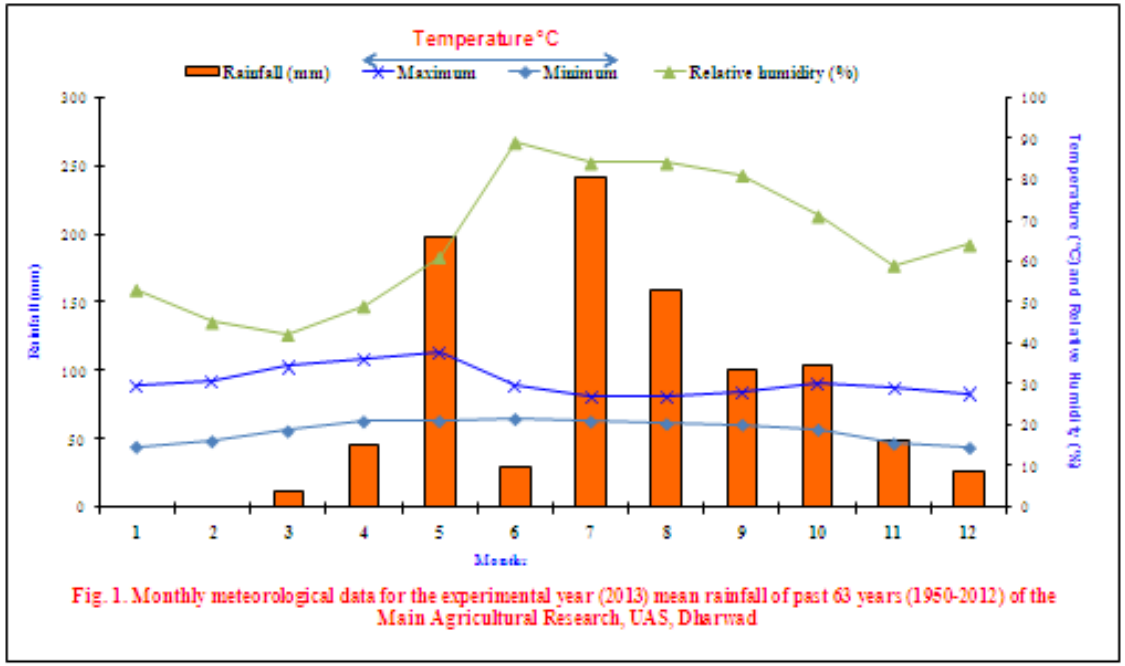
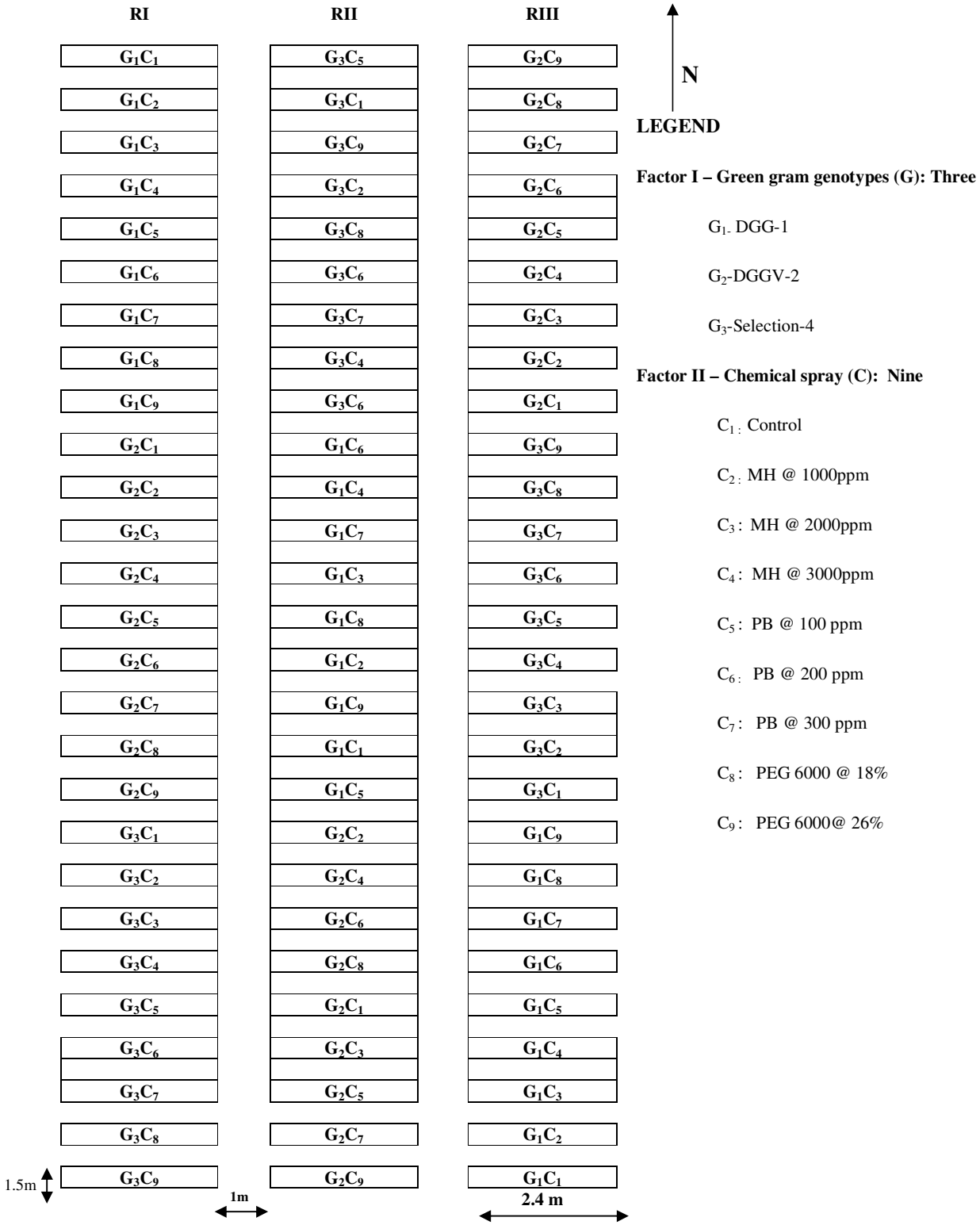


Fig. 1. Monthly meteorological data for the experimental year (2013) mean rainfall of past 63 years (1950-2012) of the Main Agricultural Research, UAS, Dharwad



LEGEND

Factor I – Green gram genotypes (G): Three

G_1- DGG-1

G_2-DGGV-2

G_3-Selection-4

Factor II – Chemical spray (C): Nine

C_1 : Control

C_2 : MH @ 1000ppm

C_3 : MH @ 2000ppm

C_4 : MH @ 3000ppm

C_5 : PB @ 100 ppm

C_6 : PB @ 200 ppm

C_7 : PB @ 300 ppm

C_8 : PEG 6000 @ 18%

C_9 : PEG 6000@ 26%

Fig. 2 : Plan and layout of the experimental site

Plate 1 General view of the experimental plot of green gram

early establishment of seedlings at first two (I FN of June and II FN of June, respectively) dates of sowing. However the late sown (first fort night July and second fort night of July) crop did not get adequate moisture during crop growth stage. Even though the maximum rainfall in the current year was received in the month of July (112.2 mm) followed by August (90 mm), the distribution of rainfall was erratic. Hence, in delayed sowing dates (I FN of July and II FN of July) crop suffered due to moisture stress.

3.1.3 Soil and its characteristics

The soil type of experimental site was black clay loamy soil. The composite soil sample to a depth of 0 to 30 cm was collected before sowing and analyzed for physical and chemical properties. The values obtained along with the methods employed are presented in Table 2. The soil was neutral in pH, normal in salt content, high in organic matter content, medium in available of nitrogen and phosphorus, high in available of potassium, medium in available sulphur, critical in available of zinc and boron.

3.1.4 Seed source

The seeds of three genotypes of greengram used for experiment were collected from the senior seed scientist MULLaRP scheme, University of Agricultural Sciences, Dharwad.

3.2 Experiment I: Effect of different dosages of MH, PB, PEG as pre-harvest spray to induce seed dormancy in field condition in green gram genotypes.

The field experiment consisted of two factors *viz.,* three genotypes and nine spray inclusive of the control treatment. Total treatment combinations were 27 with three replications as given below.

Table 2. Soil physical and chemical properties of experimental site

Sl. No.	Particular	Value	Method employed	Reference
I.	Particle size distribution			
1.	Coarse sand (%)	6.80	International pipette method	Piper (1966)
2.	Fine sand (%)	12.03		
3.	Silt (%)	33.97		
4.	Clay (%)	47.20		
5.	Textural class	Clay		
6.	Bulk density (g/cc)	1.45		
7.	Field capacity (%)	32.6		
II.	Chemical property			
1.	pH (1:1.25 soil: water suspension)	7.35	Buckman's pH meter	Piper (1966)
2.	EC (1:1.25 soil: water suspension) (dS/m)	0.32	Conductivity bridge	Piper (1966)
4.	Available nitrogen (kg N/ha)	328.64	Alkaline permanganate method	Subbiah and Asija (1956)
5	Available phosphorus (kg P_2O_5/ha)	34.5	Olsen's method	Jackson (1967)
6.	Available potassium (kg K_2O /ha)	450.3	Flame photometric method	Jackson (1967)

3.2.1 Treatment details

Factor I – Green gram genotypes (G): Three

G_1- DGG-1

G_2-DGGV-2

G_3-Selection-4

Factor II – Chemical spray (C): Nine

C_1 : Control

C_2 : Maleic hydrazide (MH) @ 1000ppm

C_3 : Maleic hydrazide (MH) @ 2000ppm

C_4 : Maleic hydrazide (MH) @ 3000ppm

C_5 : Paclobutrazol (PB) @ 100 ppm

C_6 : Paclobutrazol (PB) @ 200 ppm

C_7 : Paclobutrazol (PB) @ 300 ppm

C_8 : Polyethylene glycol (PEG) 6000 @ 18%

C_9 : Polyethylene glycol (PEG) 6000@ 26%

Treatment combinations: 9 X 3=27.

3.2.2 Design of the experiment

The experiment was laid out in RBD in factorial concept in two factorial concept with three replications. The size of the gross plot was 2.0 m × 3.0 m=60m^2 and the net plot 1.50 m×2.5 m =3.75m^2.

3.2.3 Description of genotypes

1. DGG -1: The new variety of Greengram DGG -1 has released by UAS Dharwad during 2014 for zone 8 of Karnataka. It is a high yielding variety with bold and shining seeds. Plant type of this variety is similar to popular variety Chinamung. It is having high and stable yielding ability is moderately resistant to powdery mildew and Cercospora leaf spot.

2. DGGV-2: Notified for cultivation during kharif in 2012 for agro climatic Zone-8 of the state. It is a high yielding, has more number of pods per plant, bold seeded, with shining seeds and has longer pods compared to the local/popular variety Chinamung. DGGV-2 matures in 70-75 days is suitable for mechanical harvesting

3. Selection 4: The green gram variety selection 4 is been released and notified in the year 2001 for cultivation during *kharif* season. The crop duration is about 65-70 days and has potential to yield about 15-16q per ha with bold and shining seeds. It gives higher yield over Chinamung and is moderately resistant to shattering.

3.2.4 Cultural practices

3.2.4.1 Land preparation

After the harvest of previous crop, land was ploughed once with mould board plough and was brought to fine tilth by harrowing. The residues of previous crop and weeds were collected from the experimental area. Finally, the plots were laid out by putting small bunds. The bacterial inoculant of *Rhizobium* was uniformly treated to the seeds before sowing. As per treatment details, the organic manures was incorporated in the soil before 15 days of sowing.

3.2.4.2 Manure and fertilizers application

The manures and fertilizers were applied as per the treatment combinations. Farmyard manure was incorporated in soil 15 days before sowing. The recommended fertilizer dose of 40 kg N, 80 kg P_2O_5 and 25 kg K_2O per hectare was applied in the form of urea, diammonium phosphate and muriate of potash, respectively at the time of sowing.

3.2.4.3 Sowing and thinning

The green gram seeds were treated with *Rhizobium* @ 375 g/15 kg seeds/ha uniformly before sowing. Two-three seeds of green gram were hand dibbled at 2-3 cm deep in the soil at 30 × 10 cm spacing, on 24th July, 2014. To get optimum plant population gap filling was done after seven days of sowing to maintain expected plant population per plot. Thinning operation was carried out 15 days after sowing by removing weak and unhealthy seedlings. Only one healthy plant was maintained per hill.

3.2.5 Aftercare

The necessary aftercare operations such as hand weeding, irrigation, inter culturing and plant protection measures were attended as and when required. The recommended agronomic practices were taken up timely during the crop growth during the entire investigation period. The crop was also kept free from pests like leaf eating, sucking pests and diseases like Cercospora and Bacterial leaf spots by spraying appropriate insecticides (Curacron @ 2ml/lt ,Contaf 1ml/l) and fungicides (Tilt) whenever it is required.

3.2.6 Harvesting and threshing

Turning of pods from green to black colour was the indication of maturity for the harvesting. Harvesting was carried out on 10th October, 2014. The black coloured pods were picked from five randomly selected and tagged plants from each treatment separately for recording of observations. The pods were dried in sun for four days and the seeds were separated by gentle beating with wooden stick. The seeds were cleaned by winnowing. Similarly, remaining plants from net plot area were harvested, threshed and winnowed.

3.2.7 Collection of experimental data

Five normal and healthy plants were selected randomly from net plot area of each experimental plot and were tagged with a wax coated label for recording observations of various crop growth, seed yield and quality components of the present investigation. The details of the various observations recorded are furnished below.

3.2.7.1 Growth parameters

3.2.7.1.1 Plant height (cm)

The plant height was measured from the base of the plant to the tip of the main shoot of five randomly tagged plants with the help of scale at 30, 60 DAS (days after sowing) and at harvest stage in each treatment. The average of five plants was computed and expressed as the plant height in centimeters (cm) for respective stage of crop growth.

3.2.7.1.2 Number of branches per plant

The number of branches per plant was recorded from the earlier tagged plants at 30, 60 days after sowing and at harvest stage in each treatment. The average number of branches per plant was computed and expressed in number for respective stage of crop growth.

3.2.7.2 Yield and yield components

3.2.7.2.1 Number of pods per plant

The number of pods per plant was recorded from the earlier tagged plants at 30, 60, 75 days after sowing and at harvest stage for each treatment. The average number of pods per plant was computed and expressed in number for respective stage of crop growth.

3.2.7.2.2 Pod length (cm)

The pod length of five different pods of different plants in random was recorded at 60, 75 days after sowing and at harvest stage in each treatment. The average number of pod length was computed and expressed in number for respective stages of crop growth.

3.2.7.2.3 Number of seeds per pod

The number of seeds per pod of five different pods at 60, 75 days after sowing and at harvest stage for each treatment was taken for observation. The average number of seeds per pod was computed and expressed in number for respective stage of crop growth.

3.2.7.2.4 Seed setting percentage

The seed setting percentage was recorded from five different pods at 60, 75 days after sowing and at harvest stage for each treatment. The average number of seed setting percentage was computed and expressed in percentage for respective stage of crop growth.

3.2.7.2.5 Pod yield per plant (g)

The total number of pods obtained from five randomly selected and tagged plants was weighed separately with the help of an electric balance. The average weight was computed and expressed in grams per plant.

3.2.7.2.6 Pod yield per plot (kg)

The total number of pods obtained from each plot was weighed separately with the help of balance. The average weight was computed and expressed as pod weight (kg) per plot.

3.2.7.2.7 Pod yield per hectare (kg)

The pod yield obtained from the net plot area of each treatment was added. The pod yield per hectare was computed and expressed in kg per hectare.

3.2.7.2.8 Seed weight per plant (g)

The matured pods harvested from five randomly selected and tagged plants in each treatment were sun dried and the seeds were separated, the average was worked out and expressed as seed weight per plant in grams.

3.2.7.2.9 Seed yield per plot (kg)

The well matured pods harvested from the net plot area in each treatment were sun dried, threshed and seeds were separated from the pods. The weight of the seeds from net plot area was recorded and expressed as seed yield per plot (kg).

3.2.7.2.10 Seed yield per hectare (kg)

The seed yield obtained from the net plot area of each treatment was added to the yield obtained from five tagged plants. The seeds were cleaned and dried in shade for five days. After size grading seed weight was recorded in kgs. The seed yield per hectare was computed and expressed in kg per hectare.

3.2.7.2.11 Thousand seed weight (g)

Thousand seeds in each treatment were counted randomly and the weight was recorded as per the procedure given by ISTA rules (Anon., 2011). The average thousand seed weight was recorded in grams.

3.2.7.3 Seed quality parameters

3.2.7.3.1 Germination (%)

The seeds were drawn randomly from each treatment and the germination test was conducted as per the ISTA Rules (Anon., 2011) by adapting the between paper method at $25^0 \pm 1^0$ C and 98±1 % relative humidity in the seed germinator in four

replications of 100 seeds each. On seventh day of germination test, the number of normal seedlings germinated were counted and expressed as germination percentage.

3.2.7.3.2 Dormant seed (%)

The number of non germinated seeds and remain firm at the end of the test were counted and expressed as dormant seed percentage.

3.2.7.3.3 Root length (cm)

Ten normal seedlings in each treatment were randomly selected from all the replications for measuring root length on 8th day of germination test. The root length was measured from collar region to the tip of root. Average root length of ten seedlings was computed and expressed in centimeters.

3.2.7.3.4 Shoot length (cm)

Ten normal seedlings used for root length measurement were used for shoot length measurement also. The shoot length was measured from the collar region to the point of attachment of cotyledons to the tip of shoot. The average of ten seedlings was computed and expressed in centimeters.

3.2.7.3.5 Seedling dry weight (mg)

Ten normal seedlings, used for root and shoot length measurement from each treatment were taken and kept in a butter paper pocket, dried in hot air oven maintaining at 75°C for 24 hours. The dried seedlings were cooled in a desiccator for 30 minutes, and then seedlings were weighed in an electronic balance and were expressed in milligram per seedling.

3.2.7.3.6 Seedling vigour index

Seedling vigour index was calculated by adopting the formula as suggested by Abdul-Baki and Anderson (1973) and was expressed in whole number by using the formula as below Seedling vigour index = Germination (%) x [root length (cm) + shoot length (cm)]

3.2.7.3.7 Rate of germination

Seeds were germinated in paper medium with four replications of hundred seeds each. The number of seeds germinated was recorded daily up to the day of final count. The speed of germination was calculated by adopting the fallowing formula and expressed in number (Magure, 1962).

$$\text{Rate of germination} = \frac{X1}{Y1} + \frac{(X2-X1)}{Y2} + \ldots\ldots\ldots + \frac{Xn - (Xn - 1)}{Yn}$$

Where,

Xn – Number of seeds germinated at n^{th} count

Yn – Number of days from sowing to n^{th} count

3.2.7.3.8 Seed infestation (%)

About 100 seeds were chosen randomly from each treatment in four replications and observed manually by using 10X magnifying lens for external damages on seeds due to attack of bruchids. The seeds having eggs on their surface, single or multiple holes were counted as infested seeds and their average was expressed as percentage of insect infested seeds.

$$\text{Seed infestation (\%)} = \frac{\text{Number of seeds with insect emergent holes}}{\text{Total number of seeds observed}} \times 100$$

3.2.7.3.9 Seed infection (%)

Storage fungi present on seeds were detected using blotter method as prescribed in ISTA, (Anon, 2011). Twenty five seeds were placed equidistantly on three layered moistened blotter taken in sterilized petriplate. Each treatment was replicated four times. They were incubated at $20^0 \pm 2^0$ C for seven days with alternate

cycle of 12 hr near ultra violet (NUV) range and for remaining 12 hr in dark. On eighth day, the plates were examined under stereo binocular microscope for the presence of seed borne fungi. The number of infected seeds were counted and expressed in percentage.

$$\text{Seed infection (\%)} = \frac{\text{Number of disease infected seeds}}{\text{Total number of seeds observed}} \times 100$$

3.2.7.3.10 Moisture content (%)

The moisture content of the seed was determined by the Hot Air Oven method as per ISTA rules (Anon, 2011). Five grams of coarsely ground seed material from each treatment in four replications were dried in a Hot Air oven maintained at a temperature of $103^0 \pm 1^0$C for a period of 17±1 hour. Then samples were cooled in a desiccator and moisture content was determined by using the formula given below and expressed in parentage.

$$\text{Moisture content (\%)} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

Where,

W_1 = Weight of empty aluminum cup (g)

W_2 = Weight of empty aluminum cup with ground seed material before drying (g)

W_3 = Weight of empty aluminum cup with ground seed material after drying (g)

3.2.7.3.11 Protein content (%)

About five grams of seed sample from each treatment was made into fine powder with the help of grinder. Then, 0.5 g of ground seed material was taken for estimation of nitrogen by adopting Microkjeldhal's method (Jackson, 1967). The protein content in the seeds was obtained by multiplying the nitrogen content with conversion factor (6.25) and then expressed in percentage.

Crude protein content (%) = Nitrogen content (%) × 6.25

$$\text{Nitrogen content (\%)} = \frac{\text{ml. of } H_2SO_4 \text{ used for titration X 0.2 X 14.007}}{\text{Weight of sample (g)}} \times 100$$

3. 2.7.3.12 Statistical analysis

The experimental data collected from field and laboratory experiments for various seed yield and its components and quality parameters were analysed statistically by adopting appropriate statistical design as described by Sundarrajan *et al.* (1972) and Panse and Sukhatme (1978). The critical difference (CD) values were calculated at five per cent and one per cent probability level wherever 'F' test was found significant. The data in percentage were transformed into arc sine root transformation and same was used for statistical analysis.

3.3 Experiment II: Effect of different dosages of dormancy inducing chemicals as seed treatment on seed quality parameters during storage in green gram genotypes

3.3.1 Experimental details

The field experiment was conducted to study the effect of different dosages of dormancy inducing chemicals as seed treatment on seed quality parameters during storage in green gram genotypes. Seed quality studies were carried out in the Laboratory of National Seed Project, Dharwad , Karnataka. The details of the experiment, materials used and techniques adopted are given below.

3.3.1.1 Seed source:

The seeds used for experiment were collected from the senior scientist (Plant breeding) MULLaRP scheme, University of Agricultural Sciences, Dharwad.

3.3.1.2 Treatment details

Factor I – Green gram genotypes (G): Three

G_1- DGG-1

G_2-DGGV -2

G_3-Selection-4

Factor II – Chemical treatment (C):

C_1 : Control

C_2 : Maleic hydrazide (MH) @ 1000ppm

C_3 : Maleic hydrazide (MH) @ 2000ppm

C_4 : Maleic hydrazide (MH) @ 3000ppm

C_5 : Paclobutrazol (PB) @ 100 ppm

C_6 : Paclobutrazol (PB) @ 200 ppm

C_7 : Paclobutrazol (PB) @ 300 ppm

C_8 : Polyethylene glycol (PEG) 6000 @ 18%

C_9 : Polyethylene glycol (PEG) 6000@ 26%

3.3.1.3 Design of the experiment

The seed storage experiment was laid out in Completely Randomised Block design with factorial concept in four replications.

3.3.1.4 Treatment combinations: 9X3=27

3.3.2 Method of treatment

The fresh seeds of green gram var. DGG-1 DGGV-2 and Selection 4 were treated with the eight chemicals dosage with one control treatment. Treated seeds were packed in HDPE bag and stored under room condition at Seed Quality and Research Laboratory, National Seed project, University of Agricultural Sciences, Dharwad. The observations on seed quality parameters were recorded at monthly interval during storage period till the dormancy period was completely over.

3.3.3 Methods of storage

About 500gram of treated seeds was stored in clean fresh HDPE bag. The HDPE bag were tightly closed with a strong thread and kept in ambient conditions in the Seed Quality and Research Laboratory, National Seed Project (Crops), University of Agricultural Sciences, Dharwad.

3.4.4 Recording of observations

To record the observations on seed quality parameters required quantity of sample was drawn from HDPE bag at monthly interval for the following seed quality parameters.

3.4.4.1 Germination (%)

The germination percentage was recorded as per the procedure explained in section 3.2.7.3.1

3.4.4.2 Dormant seeds (%)

The germination percentage was recorded as per the procedure explained in section 3.2.7.3.2

3.4.4.3 Root length (cm)

Root length was determined as per the procedure explained in section 3.2.7.3.3

3.4.4.4 Shoot length (cm)

Shoot length was determined as per the procedure explained in section 3.2.7.3.4

3.4.4.5 Seedling dry weight (mg)

The seedling dry weight was determined as per the procedure detailed in section 3.2.7.3.5

3.4.4.6 Seedling vigour index

Seedling vigour index was computed for each treatments as per the procedure explained in section 3.2.7.3.6

3.4.4.7 Rate of germination

Rate of germination was computed for each treatments as per the procedure explained in section 3.2.7.3.7

3.4.4.8 Seed infestation (%)

Seed infestation was computed for each treatments as per the procedure explained in section 3.2.7.3.8

3.4.5.9 Seed infection (%)

Seed infection was computed for each treatments as per the procedure explained in section 3.2.7.3.9

3.4.5.10 Moisture content (%)

Moisture content was determined as per the procedure detailed in section 3.2.7.3.10

3.4.5.11 Protein content (%)

Protein content was determined as per the procedure explained in section 3.2.7.3.11

3.4.5.12 Statistical analysis

The data collected from this experiment were analyzed statistically by the procedure prescribed by Sundarrajan *et al*. (1972). Critical difference were calculated at 1% level wherever 'F' test was significant. The data on percentage of germination, percentage of dormant seeds were transferred in to arcsine square root percentage values and transferred data were used for statistical analysis (Snedecor and Cochran, 1967).

4. EXPERIMENTAL RESULTS

The field experiment was conducted to study the Induction of seed dormancy in green gram genotypes (*Vigna radiata* L.). In addition to this, a laboratory experiment was also conducted to study the effect of seed treatment with different chemicals to induce seed dormancy during storability of green gram under ambient condition in the Department of Seed Science and Technology, College of Agriculture, Dharwad. The results obtained from the above studies are presented in this chapter.

4.1 Experiment – I: Studies on effect of foliar spray of dormancy inducing chemicals on green gram genotypes

4.1.1 Growth parameters

4.1.1.1 Plant height (cm)

The data on plant height at 30, 60 days after sowing (DAS) and at harvest as influenced by different dormancy inducing chemicals and different genotypes are presented in Table 3.

Due to genotypes (G)

The plant height did not significantly vary among the genotypes at 30 DAS. However it significantly varied among the genotypes at 60 DAS and at harvest. G_3 gave significantly highest plant height followed by $G_1$and G_2 in both stages with 51.76, 51.35 and 50.98 cm at 60 DAS and at harvest stage 54.01, 53.92 and 53.68 cm.

Due to chemicals(C)

The plant height at 30 DAS did not differ significantly while significant differences were observed at 60 DAS and at harvests.

At 60 DAS application of C_8 recorded significantly higher plant height (57.80 cm) which was on par with C_9 (57.10 cm) and C_1 (52.53) , least height was seen with C_2 (47.24cm).

Table 3. Effect of foliar spray of dormancy inducing chemicals on plant height of green gram genotypes

Treatment	Plant height(cm)											
	Genotypes (G)											
	30 DAS				60 DAS				Harvest stage			
Chemicals(C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	23.70	24.31	22.20	23.40	52.70	52.10	52.80	52.53	54.05	55.08	54.62	54.58
C2	25.23	24.67	24.37	24.75	47.21	47.00	47.50	47.24	50.17	50.33	51.07	50.19
C3	25.12	25.51	25.83	25.48	49.20	49.80	50.30	49.77	54.17	54.70	54.84	54.57
C4	24.56	24.32	24.39	24.42	51.30	50.80	51.90	51.33	52.69	55.06	53.63	53.79
C5	25.27	22.36	23.46	23.69	52.40	52.50	52.66	52.52	54.78	55.31	55.45	55.18
C6	22.56	26.35	24.77	24.56	52.70	52.40	53.10	52.73	54.67	54.63	54.87	54.72
C7	26.50	22.31	21.89	23.56	49.60	48.50	50.20	49.43	51.80	52.17	51.87	51.94
C8	25.55	22.06	24.64	24.08	53.21	53.3	54.19	53.56	55.70	54.07	54.37	55.71
C9	25.18	23.67	23.94	24.26	53.22	52.41	53.18	53.10	55.07	54.77	54.60	55.48
Mean	24.95	23.95	23.94	24.25	51.35	50.98	51.76	51.36	53.68	54.01	53.92	53.95
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.360	0.720	1.410		0.190	1.003	4.330		0.220	1.536	2.560	
CD (p=0.05)	NS	NS	NS		0.57	3.01	NS		0.51	4.61	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

At harvest stage plant height was significantly more with C_8 (55.71 cm) which was on par with C_9 (55.48 cm) and least height was seen with C_2 (50.19).

Due to interaction of genotypes and chemicals (GxC)

The plant height did not differ significantly due to interaction between chemicals and genotypes. However, numerically highest plant height was recorded in G_3C_8 (54.19 cm) and less in G_2C_2 (47 cm) at 60 DAS and high in G_2C_8 (55.70 cm) and least in G_2C_2 in (50.17 cm) at harvest stage.

4.1.1.2 Number of branches

The data on number of branches per plant at 30, 60 days after sowing (DAS) and at harvest as influenced by growth regulators and nutrients are presented in Table 4.

Due to genotypes (G)

The plant branches did not significantly vary among the genotypes at 30 DAS. But at 60 and harvest stage they differed significantly. At 60 DAS and at harvest stage G_2 (4.82, 5.27) gave significantly more number of branches followed by G_1 (4.87, 5.18) and G_3 (4.70, 5.09) respectively at 60 DAS and at harvest stage.

Due to chemicals (C)

The number of branches at 30 DAS did not differ significantly while significant differences were observed at 60 DAS and at harvests.

At 60 DAS application of MH@1000ppm C_2 recorded significantly more number of branches (5.44) which was followed by C7 (5.14) and least number of branches was seen with C_9 (4.18)

At harvest stage significant differences were noticed among the chemicals for number of branches. Highest branches was seen with C_2 (5.94) followed by C7 (5.69) and least number of branches was seen in C_5 (4.83)

Table 4. Effect of foliar spray of dormancy inducing chemicals on number of branches per plant of green gram genotypes

Treatment	Number of branches per plant											
	Genotypes (G)											
	30 DAS				60 DAS				Harvest stage			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	2.67	2.00	3.00	2.56	4.59	4.48	4.36	4.48	5.14	5.24	4.95	5.11
C2	3.00	2.67	2.33	2.67	5.77	5.01	5.55	5.44	5.93	5.99	5.90	5.94
C3	2.33	3.00	2.33	2.56	5.05	5.15	5.22	5.14	5.16	5.18	5.22	5.19
C4	2.33	2.67	2.33	2.44	5.03	5.02	4.97	5.01	5.63	5.73	5.53	5.63
C5	3.00	3.00	2.67	2.89	4.57	4.67	4.46	4.57	4.83	4.96	4.70	4.83
C6	2.00	2.33	2.33	2.22	4.86	4.82	4.85	4.84	5.10	5.22	4.83	5.05
C7	2.33	2.33	2.67	2.44	5.40	5.57	4.46	5.14	5.74	5.69	5.63	5.69
C8	2.67	2.67	2.67	2.67	4.38	4.39	4.32	4.36	5.15	5.16	5.12	5.14
C9	2.67	2.67	2.67	2.67	4.15	4.26	4.12	4.18	5.07	5.19	5.00	5.12
Mean	2.56	2.59	2.56	2.57	4.87	4.82	4.70	4.91	5.18	5.27	5.09	5.18
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.016	0.117	0.430		0.040	0.065	0.65		0.048	0.070	0.68	
CD (p=0.05)	NS	NS	NS		0.11	0.19	NS		0.14	0.21	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to interaction of genotypes and chemicals (GxC)

The interaction effect of genotypes and chemicals was non significant for number of branches However, numerically higher number of branches per plant recorded in G_1C_2 (5.77) and less in G_3C_9 (4.12) at 60 DAS and highest inG_2C_2 (5.99) and lowest in G_3C_5 (4.70) at harvest stage.

4.1.2 Yield and yield parameters

4.1.2.1 Number of pods per plant

The data on number of pods per plant as influenced by dormancy inducing chemicals and genotypes are presented in Table 5

Due to genotypes (G)

The number of pods differed significantly among the genotypes at 60, 75 DAS and at harvest stage. G_2 gave significantly more number of pods per plant followed by G_1 and G_3 in all three stages with 10.00, 9.66 and 9.63 at 60 DAS, 14.35, 14.20 and 14.09 at 75 DAS and 14.74, 14.60 and 14.42 at harvest stage

Due to chemicals (C)

At 60 DAS application of C_2 recorded significantly more number of pods (11.69) which was followed by C7 (11.06) and least number of pods per plant was seen with C_9 (8.54)

At 75 DAS C_2 gave significant more number of pods (16.28) followed by C7 (15.84) and with the least in C_9 (12.57).

At harvest stage significant differences were noticed among the chemicals on number of pods. Highest was seen with C_2 (16.51) followed by C7 (15.92) and least number of pods per plant was seen in C_9 (13.26).

Table 5. Effect of foliar spray of dormancy inducing chemicals on number of pods per plant of green gram genotypes

Treatment	Number of pods per plant											
	Genotypes (G)											
	60 DAS				75DAS				Harvest stage			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	8.59	8.88	8.48	8.65	12.81	12.87	12.64	12.77	13.36	13.59	13.40	13.45
C2	11.11	12.32	11.63	11.69	16.14	16.40	16.3	16.28	16.86	16.98	15.68	16.51
C3	10.23	10.31	10.4	10.31	15.1	15.15	14.77	15.01	15.27	16.01	15.27	15.52
C4	10.04	10.46	10.2	10.23	14.84	14.75	14.61	14.73	15.2	15.24	15.16	15.20
C5	8.99	9.11	9.06	9.05	13.92	14.03	13.82	13.92	14.38	14.00	14.18	14.19
C6	9.74	9.85	9.46	9.68	14.40	14.24	13.84	14.16	14.22	13.77	13.71	13.90
C7	11.16	11.28	10.75	11.06	15.52	16.38	15.62	15.84	15.62	16.08	16.07	15.92
C8	8.42	8.87	8.34	8.64	12.59	12.68	12.58	12.61	13.38	13.52	13.18	13.36
C9	8.64	8.93	8.35	8.54	12.52	12.72	12.49	12.57	13.12	13.50	13.17	13.26
Mean	9.66	10.00	9.63	9.78	14.20	14.35	14.09	14.21	14.60	14.74	14.42	14.59
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.104	0.180	1.823		0.077	0.308	2.453		0.063	0.343	2.060	
CD (p=0.05)	0.31	0.54	NS		0.23	0.92	NS		0.19	1.03	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to interaction of genotypes and chemicals (GxC)

The interaction effect of genotype and chemicals were non significant on number of pods per plant. However, numerically higher number of pods per plant recorded in G_2C_2 (12.32) and less in G_3C_8 (8.34) at 60 DAS, the highest number of pods per plant in G_2C_2 (16.40) and the lowest in G_3C_9 (12.49) at 75 DAS and at harvest stage G_2C_2 with the highest number of pods (16.98) and least in G_3C_9 (13.17).

4.1.2.2 Pod length (cm)

The data on pod length per pod as influenced by dormancy inducing chemicals and genotypes are presented in Table 6

Due to genotypes (G)

The pod length differed significantly among the genotypes at 60 DAS, 75 DAS and at harvest stage. At 60 DAS G_2 gave the highest pod length (8.96 cm) followed by G_1(8.88cm) and G_2(8.84 cm). At 75 DAS G_2 gave the highest pod length (11.68 cm) followed by G_1 (11.60 cm) and G_3 (11.44 cm) and at harvest stage the highest in G_2 (11.79 cm) followed by G_1(11.74cm) and G_3(11.54 cm)

Due to chemicals (C)

At 60 DAS application of C_2 recorded significantly higher pod length (9.32cm) which was followed by C7 (9.29cm) and the least pod length was seen with C_9 (8.39)

At 75 DAS C_2 gave significant highest pod length (13.30 cm) followed by C7 (13.14 cm) and with least in C_9 (10.29 cm).

At harvest stage significant differences were noticed among chemicals on pod length. Highest was seen with C_2 (13.46 cm) followed by C7 (13.26 cm) and the least pod length was seen in C_9 (10.33 cm).

Table 6. Effect of foliar spray of dormancy inducing on pod length of green gram genotypes

Treatment	Pod length (cm)											
	Genotypes (G)											
	60 DAS				75 DAS				Harvest stage			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	8.53	8.62	8.51	8.55	10.86	10.65	10.67	10.73	11.04	11.12	11.00	11.05
C2	9.33	9.48	9.14	9.32	13.25	13.46	13.18	13.30	13.48	13.49	13.41	13.46
C3	9.14	9.23	9.10	9.16	12.06	12.13	11.89	12.03	12.26	12.21	11.91	12.13
C4	9.00	9.19	8.98	9.06	11.58	11.77	11.32	11.56	11.59	11.79	11.35	11.58
C5	8.98	9.00	8.95	8.98	11.26	11.32	11.05	11.21	11.31	11.33	11.09	11.24
C6	8.84	8.89	8.80	8.84	11.43	11.44	11.37	11.41	11.48	11.49	11.44	11.47
C7	9.29	9.31	9.26	9.29	13.12	13.29	13.01	13.14	13.40	13.41	12.98	13.26
C8	8.44	8.50	8.44	8.46	10.41	10.55	10.57	10.51	10.64	10.79	10.63	10.69
C9	8.39	8.42	8.37	8.39	10.44	10.50	9.94	10.29	10.44	10.52	10.03	10.33
Mean	8.88	8.96	8.84	8.89	11.60	11.68	11.44	11.57	11.74	11.79	11.54	11.69
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.033	0.153	0.373		0.073	0.139	1.256		0.066	0.530	1.120	
CD (p=0.05)	0.10	0.46	NS		0.22	0.41	NS		0.20	1.59	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to interaction of genotypes and chemicals (GxC)

The interaction effect of genotypes and chemicals were non significant on pod length. However, numerically pod length was recorded in G_2C_2 (9.48 cm) and less in G_3C_9 (8.37 cm) at 60 DAS, the highest in G_2C_2 (13.46 cm) and the lowest in G_3C_9 (9.94cm) at 75 DAS and at harvest stage G_2C_2 with the highest pod length (13.49 cm) and least in G_3C_9 (10.03 cm) at harvest stage.

4.1.2.3 Number of seeds per pod

The data on number of seeds per pod as influenced by dormancy inducing chemicals and genotypes are presented in Table 7

Due to genotypes (G)

The number of seeds per pods varied significantly among the genotypes. Maximum was observed in G_2 (9.96, 12.52 and 12.52) as compared to the G_1 (9.89, 12.29 and 12.35) and less seeds per pods in G_3 (9.81, 12.13 and 12.22) at 60, 75 DAS and at harvest stages respectively.

Due to chemicals (C)

At 60 DAS application of C_7 recorded significantly higher number of seeds per pod (10.12) which was followed by C2 (10.11) and least was seen with C_9 (9.63)

At 75 DAS C_2 gave significant highest number of seeds per pod (14.76) followed by C7 (14.72) and with least in C_9 (10.38).

At harvest stage significant differences were noticed among the chemicals on number of seeds per pod. Highest was seen with C_2 (14.77) followed by C7 (14.74) and least number of seeds per pod was seen in C_9 (10.64).

Due to interaction of genotypes and chemicals (GxC)

Significant differences were not noticed on number of seeds per pod due to interaction of genotypes and chemicals. However, relatively higher and lower number

Table 7. Effect of foliar spray of dormancy inducing chemicals on number of seeds per pod of green gram genotypes

Treatment	Number of seeds per pod											
	Genotypes (G)											
	60 DAS				75DAS				Harvest stage			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	9.75	9.81	9.70	9.75	11.23	11.23	10.74	11.07	11.43	11.33	10.75	11.17
C2	10.08	10.24	10.00	10.11	14.72	14.91	14.65	14.76	14.73	14.93	14.65	14.77
C3	10.08	10.10	9.89	10.02	13.26	13.91	13.32	13.50	13.26	13.95	13.34	13.52
C4	9.94	9.99	9.87	9.93	12.46	12.72	12.34	12.51	12.49	12.79	12.37	12.55
C5	9.80	9.87	9.76	9.81	11.23	11.54	11.29	11.35	11.27	11.57	11.30	11.38
C6	9.86	9.92	9.82	9.87	11.89	12.24	11.72	11.95	11.88	12.25	11.74	11.96
C7	10.00	10.16	10.09	10.12	14.68	14.87	14.61	14.72	14.70	14.88	14.63	14.74
C8	9.72	9.80	9.66	9.73	10.54	10.71	10.55	10.60	10.74	10.81	10.63	10.73
C9	9.65	9.73	9.50	9.63	10.53	10.63	9.93	10.38	10.62	10.69	10.60	10.64
Mean	9.89	9.96	9.81	9.89	12.29	12.52	12.13	12.32	12.35	12.52	12.22	12.38
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.018	0.045	0.253		0.066	0.146	1.660		0.084	0.147	1.586	
CD (p=0.05)	0.05	0.13	NS		0.20	0.44	NS		0.25	0.43	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

of seeds per pod was recorded in G_2C_2 (10.24, 14.91, 14.93) and G_3C_9 (9.50, 9.93 and 10.60) at 60, 75 DAS and at harvest stages respectively.

4.1.2.4 Seed setting percentage

The data on seed setting percentage as influenced by dormancy inducing chemicals and genotypes are presented in Table 8

Due to genotypes (G)

The seed setting percentage varied significantly among the genotypes. Maximum was observed in G_2 (86.62, 95.41 and 96.53 %) as compared to the G_1 (86.40, 95.26 and 96.38%) and less seed setting percentage in G_3 (86.25, 95.11 and 96.23) at 60, 75 DAS and at harvest stages respectively.

Due to chemicals (C)

At 60 DAS application of C_2 recorded significantly higher seed setting percentage (88.83%) which was followed by C7 (88.44%) and least was seen with C_1 (84.27%)

At 75 DAS C_2 gave significant highest seed setting (98.88%) followed by C7 (96.19%) and with least in C_1 (92.92).

At harvest stage significant differences were noticed among the chemicals on seed setting percentage. Highest was seen with C_2 (100%) followed by C7 (97.31%) and least seed setting percentage was seen in C_1 (94.04%).

Due to interaction of genotypes and chemicals (GxC)

Significant differences were not noticed on seed setting percentage due to interaction of genotypes and chemicals. However, relatively higher and lower number of seeds per pod was recorded in G_2C_2 (88.85, 98.88 and 100%) and G_3C_9 (84.66, 93.78 and 94.90%) at 60, 75 DAS and at harvest stages respectively.

Table 8. Effect of foliar spray of dormancy inducing chemicals on seed setting percentage of green gram genotypes

Treatment	Seed setting percentage											
	Genotypes (G)											
	60 DAS				75DAS				Harvest stage			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	84.29	84.42	84.10	84.27	91.18	93.50	92.08	92.92	94.30	94.62	93.20	94.04
C2	88.84	88.85	88.80	88.83	98.88	98.88	98.88	98.88	100.00	100.00	100.00	100.00
C3	87.80	88.09	87.46	87.78	95.63	95.64	95.49	95.59	96.75	96.76	96.61	96.71
C4	86.70	87.30	86.70	86.90	95.19	95.30	95.18	95.22	96.31	96.42	96.30	96.34
C5	86.10	86.34	86.00	86.15	95.13	95.17	95.11	95.14	96.25	96.29	96.23	96.26
C6	85.76	85.89	85.43	85.69	94.88	95.05	95.04	94.99	96.00	96.17	96.16	96.11
C7	88.40	88.80	88.12	88.44	96.08	96.62	95.88	96.19	97.20	97.74	97.00	97.31
C8	85.00	85.02	84.99	85.00	94.58	94.68	94.55	94.60	95.70	95.80	95.67	95.72
C9	84.74	84.85	84.66	84.75	93.75	93.88	93.78	93.81	94.87	95.00	94.90	94.93
Mean	86.40	86.62	86.25	86.42	95.26	95.41	95.11	95.26	96.38	96.53	96.23	96.38
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.638	1.106	1.915		0.667	1.154	2.00		0.712	1.233	2.136	
CD (p=0.05)	2.41	4.18	7.24		2.52	4.36	7.56		2.69	4.66	8.07	

NS: Non-significant S: Significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

4.1.2.5 Pod yield per plant (g)

The data on pod yield per plant as influenced by dormancy inducing chemicals and genotypes are presented in Table 9

Due to genotypes (G)

The pod yield per plant varied significantly among the genotypes. Maximum was observed in G_2 (3.11g) as compared to the G_1 (3.05g) and less pod yield per plant in G_3(2.99g).

Due to chemicals (C)

The differences in pod yield per plant influenced by chemicals were found significantly. However maximum pod yield per plant was recorded in C_2 (3.45g) followed by C7 (3.23g) and had minimum pod yield per plant in C_9 (2.73g).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on pod yield per plant was non significant. However numerically the least pod yield per plant recorded in G_1C_9, G_3C_9, (2.71g) and more in G_2C_2 (3.55g) .

4.1.2.6. Pod yield per plot (kg)

The data on pod yield per plot (kg) as influenced by dormancy inducing chemicals and genotypes are presented in Table 9

Due to genotypes (G)

The pod yield per plot varied significantly among the genotypes. Maximum was observed in G_2 (0.316 kg) followed by G_1 (0.310kg) and less pod yield per plot in G_3(0.309 kg).

Due to chemicals (C)

The differences in pod yield per plot influenced by chemicals were found significantly. However maximum pod yield per plot C_2 (0.349 kg) followed by was recorded in C7 (0.327kg) and had minimum pod yield per plant C_9 (0.278kg).

Table 9. Effect of foliar spray of dormancy inducing chemicals on pod yield of green gram genotypes

Treatment	Pod yield											
	Genotypes (G)											
	Per plant(g)				Per plot(kg)				Per ha(kg)			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	2.91	2.94	2.91	2.92	0.296	0.298	0.295	0.296	821.97	827.57	820.01	823.18
C2	3.43	3.55	3.35	3.45	0.348	0.359	0.339	0.349	926.32	937.90	902.91	922.38
C3	3.24	3.26	3.23	3.25	0.328	0.330	0.327	0.328	911.13	915.86	907.20	911.40
C4	3.07	3.17	3.07	3.11	0.312	0.321	0.311	0.314	866.21	890.57	863.70	873.49
C5	2.90	2.96	2.92	2.93	0.294	0.300	0.296	0.297	817.26	833.52	821.68	824.15
C6	3.03	3.08	2.95	3.02	0.308	0.312	0.299	0.306	855.17	866.40	829.75	850.44
C7	3.30	3.42	2.95	3.23	0.335	0.346	0.299	0.327	909.21	921.40	890.50	907.04
C8	2.88	2.86	2.82	2.86	0.292	0.290	0.286	0.289	812.01	805.36	794.42	803.93
C9	2.71	2.76	2.71	2.73	0.284	0.284	0.278	0.278	765.49	789.80	765.20	773.50
Mean	3.05	3.11	2.99	3.05	0.310	0.316	0.309	0.309	853.86	865.38	843.93	854.39
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.030	0.180	0.520		0.003	0.004	0.055		4.658	28.560	60.100	
CD (p=0.05)	0.09	0.54	NS		0.01	0.01	NS		13.97	85.62	NS	

NS: Non-significant S: Significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on pod yield per plot was non significant. However numerically more pod yield was recorded in G_2C_2 (0.359 kg) and less in G_3C_9 (0.278 kg)

4.1.2.7 Pod yield per ha (kg)

The data on pod yield per ha as influenced by dormancy inducing chemicals and genotypes are presented in Table 9

Due to genotypes (G)

The pod yield per ha varied significantly among the genotypes. Maximum was observed in G_2 (865.38kg) followed by G_1 (853.86 kg) and less pod yield per ha in G_3(843.93kg).

Due to chemicals (C)

The differences in pod yield per ha influenced by chemicals were found significantly. However maximum pod yield per ha C_2 (922.38 kg) followed by was recorded in C7 (907.04 kg) and had minimum pod yield per plant C_9 (773.50 kg).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on pod yield per plot was non significant. However numerically more number of pods recorded in G_2C_2 (937.90 kg) and less in G_3C_9 (765.20kg) .

4.1.2.8 Seed yield per plant (g)

The data on seed yield per plant as influenced by dormancy inducing chemicals and genotypes are presented in Table 10.

Table 10. Effect of foliar spray of dormancy inducing chemicals on seed yield of green gram genotypes

Treatment	Seed yield											
	Genotypes (G)											
	Per plant(g)				Per plot(kg)				Per ha(kg)			
Chemicals (C)	G1	G2	G3	Mean	G1	G2	G3	Mean	G1	G2	G3	Mean
C1	2.17	2.18	2.16	2.17	0.23	0.24	0.23	0.23	638.82	639.74	629.61	636.06
C2	2.60	2.76	2.53	2.63	0.28	0.28	0.27	0.28	705.84	720.31	694.19	706.78
C3	2.43	2.45	2.42	2.43	0.25	0.26	0.24	0.25	694.07	726.33	658.85	693.08
C4	2.30	2.37	2.29	2.32	0.23	0.25	0.23	0.24	650.32	649.93	643.07	647.77
C5	2.15	2.20	2.17	2.17	0.22	0.23	0.21	0.22	603.82	604.93	594.61	601.12
C6	2.27	2.30	2.19	2.25	0.22	0.23	0.21	0.22	624.46	638.90	582.50	615.29
C7	2.49	2.58	2.19	2.42	0.26	0.27	0.25	0.26	700.07	712.62	689.78	700.82
C8	2.14	2.12	2.08	2.11	0.23	0.24	0.22	0.23	625.25	628.04	618.99	624.09
C9	1.99	2.07	2.00	2.02	0.22	0.23	0.21	0.22	610.77	619.84	607.50	612.70
Mean	2.28	2.34	2.23	2.28	0.24	0.25	0.23	0.24	650.38	660.07	635.45	648.63
	(G)	(C)	(G×C)		(G)	(C)	(G×C)		(G)	(C)	(G×C)	
S.Em±	0.01	0.133	0.25		0.005	0.008	0.0514		5.104	20.388	43.403	
CD (p=0.05)	0.03	0.40	NS		0.01	0.02	NS		15.31	61.16	NS	

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to genotypes (G)

The seed weight per plant varied significantly among the genotypes. Maximum was observed in G_2 (2.34g) followed by G_1 (2.28g) and less seed weight per plant in G_3 (2.23g).

Due to chemicals (C)

The differences in seed weight per plant influenced by chemicals were found significantly. However maximum seed weight per plant C_2 (2.63g) followed C_3 (2.43g)and had minimum seed weight per plant in C_9 (2.02g).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on seed weight per plant was non significant. However numerically more was in G_2C_2 (2.76g) and less in G_1C_9 (1.99g) .

4.1.2.9 Seed yield per plot (kg)

The data on seed yield per plot as influenced by dormancy inducing chemicals and genotypes are presented in Table 10

Due to genotypes (G)

The seed weight per plot varied significantly among the genotypes. Maximum was observed in G_2 (0.25 kg) followed by G_1 (0.24 kg) and less seed weight per plot in G_3 (0.23 kg).

Due to chemicals (C)

The differences in seed yield per plot influenced by chemicals were found significantly. Maximum seed yield per plot C_2 (0.28 kg) followed by was recorded in C_7 (0.26 kg) and had minimum seed yield per plot in C_9 (0.22kg).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on seed yield per plot was non significant. However numerically more was in G_2C_2 (0.28kg) and less in G_3C_9(0.21 kg).

4.1.2.10 Seed yield per ha (kg)

The data on seed yield per ha as influenced by dormancy inducing chemicals and genotypes are presented in Table 10.

Due to genotypes (G)

The seed yield per ha varied significantly among the genotypes. Maximum was observed in G_2 (660.07 kg) followed by G_1 (650.38 kg) and less seed weight per plot in G_3 (635.45 kg).

Due to chemicals (C)

The differences in seed yield per ha influenced by chemicals were found significantly .Maximum seed weight per ha C_2 (706.78 kg) followed by C7 (700.82 kg) and had minimum seed weight per ha in C_9 (612.70 kg).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on seed weight per ha was non significant. However numerically more was in G_2C_2 (720.31 kg) and less in G_1C_9 (607.50 kg) .

4.1.2.11 1000 seed weight (g) :

The data on 1000 seed weight as influenced by dormancy inducing chemicals and genotypes are presented in Table 11.

Due to genotypes (G)

The 1000 seed weight varied significantly among the genotypes. Maximum was observed in G_2 (39.76g) followed by G_1 (39.55g) and less in G_3 (39.38g).

Table 11. Effect of foliar spray of dormancy inducing chemicals on 1000 seed weight of green gram genotypes

Treatment	1000 seed weight(g)			
	Genotypes (G)			
Chemicals (C)	G1	G2	G3	Mean
C1	39.18	39.28	38.74	39.07
C2	41.55	41.53	41.48	41.52
C3	41.10	40.76	40.96	40.94
C4	39.49	39.73	39.86	39.70
C5	39.26	39.73	39.24	39.41
C6	39.93	40.87	40.13	40.31
C7	39.51	39.20	38.88	39.20
C8	38.65	38.89	38.26	38.60
C9	37.24	37.83	36.84	37.30
Mean	39.55	39.76	39.38	39.56
	(G)	(C)	(G×C)	
S.Em±	0.088	0.598	1.62	
CD (p=0.05)	0.26	1.79	NS	

NS: Non-significant
Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4
Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to chemicals (C)

The differences in 1000 seed weight influenced by chemicals were found significantly .Maximum 1000 seed weight C_2 (41.52g) followed by C_3 (40.94g) and had minimum seed weight per ha in C_9 (37.30g).

Due to interaction of genotypes and chemicals (GxC)

The effect of interaction between chemicals and genotypes on 1000 seed weight was non significant. However numerically more was in G_2C_2 (41.53g) and less in G_3C_9 (36.84g)

4.1.3 Seed quality attributes of progeny seeds

4.1.3.1 Seed germination (%)

The results on seed germination per cent of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 12

With the advancement of storage period, seed germination was increased drastically irrespective of the treatments except with C_1 treatment combination

Due to genotype

Germination percentage of seeds differed significantly between the genotypes in all days of storage period at weekly intervals

Among the three genotypes, G_1 was registered higher per cent of germination thought the storage period and recorded 51.89 per cent at the beginning to 73.66 per cent after 35 days of storage period, followed by G_2 from 51.50 to 72.08 per cent, respectively. Lower percentage of germination of seeds was noticed in G3 wherein, the germination percentage varied from 52.29 at the beginning to 73.29 per cent after 35 days of storage period.

Table 12. Effect of foliar spray of dormancy inducing chemicals on the seed germination (%) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Seed germination (%)					
	0	7	14	21	28	35
G_1	51.89 (46.06)	57.59 (49.35)	62.53 (52.24)	65.57 (54.05)	67.06 (54.95)	73.66 (59.10)
G_2	51.50 (45.84)	57.18 (49.11)	62.2 (52.04)	65.01 (53.83)	66.26 (54.47)	72.08 (58.08)
G_3	52.29 (46.29)	58.00 (49.58)	62.20 (52.04)	65.21 (53.83)	67.72 (55.36)	73.29 (58.86)
S.Em±	0.223	0.25	0.243	0.14	0.20	0.423
CD at (1%)	0.67	0.75	NS	0.42	0.60	1.27
Chemicals						
C_1	94.78 (76.76)	94.59 (76.52)	92.44 (74.01)	93.50 (75.20)	92.17 (73.72)	91.37 (72.89)
C_2	35.15 (36.35)	44.47 (41.81)	50.91 (45.50)	56.79 (48.88)	60.01 (50.75)	64.04 (53.13)
C_3	37.69 (37.86)	46.67 (43.07)	54.71 (47.68)	57.62 (49.36)	62.34 (52.12)	65.65 (54.10)
C_4	39.37 (38.85)	47.89 (43.77)	55.2 (47.97)	58.05 (49.61)	61.23 (51.47)	67.29 (55.09)
C_5	42.75 (40.81)	49.82 (44.88)	55.76 (48.29)	58.39 (49.81)	60.6 (51.10)	67.85 (55.44)
C_6	41.52 (40.10)	48.84 (44.32)	56.21 (48.55)	58.94 (50.13)	60.07 (50.79)	68.22 (55.66)
C_7	36.66 (37.25)	45.85 (42.60)	52.81 (46.59)	57.47 (49.28)	60.93 (51.29)	63.41 (52.76)
C_8	69.13 (56.22)	70.43 (57.04)	72.10 (58.09)	74.00 (59.32)	76.00 (60.64)	82.26 (65.06)
C_9	70.01 (56.77)	70.75 (57.24)	72.89 (58.60)	75.49 (60.30)	70.78 (57.26)	87.55 (69.31)
S.Em±	0.863	0.937	1.01	1.05	2.09	1.19
CD at (1%)	2.59	2.81	3.03	3.16	6.72	3.57
Interactions (GxC)						
T_1: G_1C_1	95.00 (77.05)	94.66 (76.61)	94.33 (76.19)	93.50 (75.20)	93.50 (75.20)	93.21 (74.87)
T_2: G_1C_2	35.4 (36.50)	44.85 (42.03)	50.77 (45.42)	56.59 (48.77)	58.00 (49.58)	65.4 (53.95)
T_3: G_1C_3	37.46 (37.72)	46.72 (43.10)	55.00 (47.85)	57.66 (49.39)	62.00 (51.92)	67.00 (54.92)
T_4: G_1C_4	39.06 (38.67)	48.10 (43.89)	55.14 (47.93)	58.05 (49.61)	61.34 (51.53)	67.21 (55.04)
T_5: G_1C_5	43.13 (41.03)	49.60 (44.75)	55.55 (48.17)	58.48 (49.86)	60.67 (51.14)	67.78 (55.39)
T_6: G_1C_6	41.41 (40.04)	49.02 (44.42)	56.17 (48.52)	58.91 (50.11)	60.00 (50.75)	68.03 (55.55)
T_7: G_1C_7	36.66 (37.25)	46.00 (42.69)	53.00 (46.70)	57.21 (49.13)	59.00 (50.16)	63.50 (52.81)
T_8: G_1C_8	68.87 (56.06)	70.34 (56.98)	71.89 (57.96)	73.93 (59.27)	75.00 (59.98)	85.00 (67.19)
T_9: G_1C_9	70.00 (56.77)	70.63 (57.16)	72.88 (58.59)	75.82 (60.52)	77.00 (61.32)	87.66 (69.41)
T_{10}: G_2C_1	95.33 (77.49)	95.11 (77.19)	95.00 (77.05)	94.50 (76.41)	94.01 (75.80)	93.46 (75.15)
T_{11}: G_2C_2	35.00 (36.26)	44.28 (41.70)	51.37 (45.77)	57.00 (49.00)	60.00 (50.75)	61.73 (51.76)

T_{12}: G_2C_3	38.20 (38.16)	47.15 (43.35)	55.00 (47.85)	58.00 (49.58)	63.00 (52.51)	63.00 (52.51)
T_{13}: G_2C_4	40.00 (39.22)	48.29 (44.00)	55.33 (48.04)	58.05 (49.61)	61.00 (51.33)	67.44 (55.18)
T_{14}: G_2C_5	43.13 (41.03)	50.41 (45.22)	56.17 (48.52)	58.65 (49.96)	60.00 (50.75)	68.03 (55.55)
T_{15}: G_2C_6	41.98 (40.37)	49.06 (44.44)	56.30 (48.60)	59.00 (50.16)	60.00 (50.75)	68.59 (55.89)
T_{16}: G_2C_7	37.25 (37.60)	46.54 (43.00)	53.66 (47.08)	58.21 (49.71)	62.00 (51.92)	62.73 (52.35)
T_{17}: G_2C_8	69.73 (56.60)	70.63 (57.16)	72.54 (58.37)	74.50 (59.65)	78.00 (62.00)	77.46 (61.63)
T_{18}: G_2C_9	70.03 (56.78)	71.00 (57.39)	73.23 (58.82)	76.33 (60.86)	59.34 (50.36)	88.00 (69.70)
T_{19}: G_3C_1	94.00 (75.79)	93.87 (75.63)	93.26 (74.92)	93.00 (74.63)	92.88 (74.49)	92.41 (73.98)
T_{20}: G_3C_2	35.06 (36.29)	44.28 (41.70)	50.6 (45.33)	56.79 (48.88)	62.03 (51.94)	65.00 (53.71)
T_{21}: G_3C_3	37.4 (37.69)	46.15 (42.77)	54.13 (47.35)	57.21 (49.13)	62.03 (51.94)	66.95 (54.89)
T_{22}: G_3C_4	39.06 (38.67)	47.29 (43.43)	55.14 (47.93)	58.05 (49.61)	61.34 (51.53)	67.21 (55.04)
T_{23}: G_3C_5	42.00 (40.38)	49.45 (44.67)	55.55 (48.17)	58.05 (49.61)	61.12 (51.40)	67.73 (55.36)
T_{24}: G_3C_6	41.18 (39.90)	48.45 (44.09)	56.17 (48.52)	58.91 (50.11)	60.2 (50.87)	68.03 (55.55)
T_{25}: G_3C_7	36.06 (36.89)	45.00 (42.11)	51.77 (46.00)	57.00 (49.00)	61.80 (51.80)	64.00 (53.11)
T_{26}: G_3C_8	68.78 (56.01)	70.33 (56.97)	71.87 (57.95)	73.57 (59.04)	75.00 (59.98)	84.33 (66.65)
T_{27}: G_3C_9	70.00 (56.77)	70.63 (57.16)	72.57 (58.39)	74.32 (59.53)	76.00 (60.64)	87.00 (68.84)
Mean	46.52 (42.99)	50.78 (45.43)	54.75 (47.71)	56.2 (48.54)	55.51 (48.14)	58.63 (49.95)
S.Em±	5.36	7.91	15.74	12.87	11.81	9.223
CD at (1%)	16.08	23.73	NS	NS	NS	NS

NS: Non-significant S: Significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to chemicals

Germination percentage of seeds significantly differed between the chemicals till 35 days of storage period. Higher seed germination percentage (94.78) was recorded in the C_1 (control) at the beginning to 91.37 per cent after 35 days of storage period, followed by C_9 from 70.01 to 87.55 per cent and lower in C_2 from 35.15 to 64.04 per cent till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Significant difference of germination percentage due to interaction effect of dormancy inducing chemicals and genotypes of seed was noticed in initial and 7^{th} day of storage with higher percentage (95.33 % to 93.46) of seed germination in G_2C_1 and lower seed percent of seed germination in G_2C_2 with 35 % and 44.28 % at initial and 7^{th} day of storage.

4.1.3.2 Dormant seed (%)

The results on dormant seed per cent of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 13.

With the advancement of storage period, seed dormancy was decreased drastically irrespective of the treatments except with C_1 (control) treatment and its combination.

Due to genotype

Dormant seed percentage of seeds differed significantly between the genotypes till 35 days of storage period at weekly intervals.

Among all the three genotypes, G_2 was registered higher per cent of dormant seeds throught the storage period and recorded 48.15 per cent at the beginning to 27.92 per cent after 35 days of storage period, followed by G_1 from 48.11 to 26.34 per

Table 13. Effect of foliar spray of dormancy inducing chemicals on the dormant seed (%) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Dormant seed (%)					
	0	7	14	21	28	35
G_1	48.11 (43.90)	42.41 (40.62)	37.47 (37.73)	34.43 (35.91)	32.94 (35.01)	26.34 (30.87)
G_2	48.15 (44.12)	42.82 (40.86)	37.80 (37.92)	34.79 (36.13)	33.74 (35.50)	27.92 (31.88)
G_3	47.71 (43.67)	42.00 (40.38)	37.80 (37.92)	34.79 (36.13)	32.28 (34.61)	26.71 (31.11)
S.Em±	0.166	0.160	0.173	0.246	0.633	0.252
CD at (1%)	0.50	0.48	0.52	0.74	1.90	0.76
Chemical						
C_1	5.22 (13.20)	5.41 (13.44)	7.56 (15.95)	6.50 (14.76)	7.83 (17.28)	8.63 (19.02)
C_2	64.85 (53.62)	55.53 (48.16)	49.09 (44.46)	43.21 (41.08)	39.99 (39.21)	35.96 (36.83)
C_3	62.31 (55.11)	53.33 (46.89)	45.29 (42.28)	42.38 (40.60)	37.66 (37.84)	34.35 (35.87)
C_4	60.63 (51.12)	52.11 (46.19)	44.80 (42.00)	41.95 (40.35)	38.77 (38.49)	32.71 (34.87)
C_5	57.25 (49.15	50.18 (45.08)	44.24 (41.68)	41.61 (40.15)	39.40 (38.86)	32.15 (34.53)
C_6	58.48 (49.86)	51.16 (45.65)	43.79 (41.42)	41.06 (39.83)	39.93 (39.17)	31.78 (34.30)
C_7	63.34 (52.72)	54.15 (47.36)	47.19 (43.37)	42.53 (40.69)	39.07 (38.67)	36.59 (37.12)
C_8	30.87 (33.74)	29.57 (32.93)	27.90 (31.87)	26.00 (30.64)	24.00 (29.32)	17.74 (24.90)
C_9	29.99 (33.19)	29.25 (32.73)	27.11 (31.36)	24.51 (29.66)	29.22 (32.71)	12.45 (20.65)
S.Em±	0.864	0.937	1.010	1.054	1.777	0.470
CD at (1%)	2.59	2.81	3.03	3.16	5.33	1.38
Interaction						
T_1: G_1C_1	5.00 (12.92)	5.34 (13.36)	5.67 (13.77)	6.50 (14.76)	6.50 (14.76)	6.79 (15.10)
T_2: G_1C_2	64.60 (53.47)	55.15 (47.94)	49.23 (44.54)	43.41 (41.20)	42.00 (40.38)	34.60 (36.02)
T_3: G_1C_3	62.54 (52.24)	53.28 (46.86)	45.00 (42.11)	42.34 (40.58)	38.00 (38.04)	33.00 (35.05)
T_4: G_1C_4	60.94 (51.30)	51.90 (46.07)	44.86 (42.03)	41.95 (40.35)	38.66 (38.43)	32.79 (34.92)
T_5: G_1C_5	56.87 (48.93)	50.40 (45.21)	44.45 (41.80)	41.52 (40.10)	39.33 (38.82)	32.22 (34.57)
T_6: G_1C_6	58.59 (49.93)	50.98 (45.54)	43.83 (41.44)	41.09 (39.85)	40.00 (39.22)	31.97 (34.42)
T_7: G_1C_7	63.34 (52.72)	54.00 (47.28)	47.00 (53.26)	42.79 (40.84)	41.00 (39.80)	36.50 (37.15)
T_8: G_1C_8	31.13 (33.90)	29.66 (32.98)	28.11 (32.01)	26.07 (30.69)	25.00 (29.99)	15.00 (22.78)
T_9: G_1C_9	30.00 (33.20)	29.37 (32.80)	27.12 (31.37)	24.18 (29.44)	23.00 (28.65)	12.34 (20.56)
T_{10}: G_2C_1	4.67 (12.48)	4.89 (12.77)	5.00 (12.92)	5.5 (13.56)	5.99 (14.16)	6.54 (14.81)
T_{11}: G_2C_2	65.00 (53.71)	55.72 (48.27)	48.63 (44.20)	43.00 (40.96)	40.00 (39.22)	38.27 (38.20)

T_{12}: G_2C_3	61.80 (51.80)	52.85 (46.62)	45.00 (42.11)	42.00 (40.38)	37.00 (37.45)	37.00 (37.45)
T_{13}: G_2C_4	60.00 (50.75)	51.71 (45.96)	44.67 (45.92)	41.95 (40.35)	39.00 (38.63)	32.56 (34.78)
T_{14}: G_2C_5	56.87 (48.93)	49.59 (44.75)	43.83 (41.44)	41.35 (40)	40.00 (39.22)	31.97 (34.42)
T_{15}: G_2C_6	58.02 (49.60)	50.94 (45.52)	43.70 (41.36)	41.00 (39.80)	40.00 (38.22)	31.41 (34.07)
T_{16}: G_2C_7	62.75 (52.37)	53.46 (46.97)	46.34 (42.88)	41.79 (40.26)	38.00 (38.04)	37.27 (37.61)
T_{17}: G_2C_8	30.27 (33.37)	29.37 (32.80)	27.46 (31.59)	25.50 (30.32)	22.00 (27.96)	22.54 (28.33)
T_{18}: G_2C_9	29.97 (33.18)	29.00 (32.80)	26.77 (31.59)	23.67 (30.32)	40.66 (27.96)	12.00 (28.33)
T_{19}: G_3C_1	6.00 (14.17)	6.13 (14.33)	6.74 (15.04)	7.00 (15.34)	7.12 (15.47)	7.59 (15.99)
T_{20}: G_3C_2	64.94 (53.67)	55.72 (48.27)	49.40 (44.64)	43.21 (41.08)	37.97 (38.02)	35.00 (36.26)
T_{21}: G_3C_3	62.60 (52.28)	53.85 (47.19)	45.87 (42.61)	42.79 (40.84)	37.97 (38.02)	33.05 (35.08)
T_{22}: G_3C_4	60.94 (51.30)	52.71 (46.53)	44.86 (42.03)	41.95 (40.35)	38.66 (38.43)	32.79 (34.92)
T_{23}: G_3C_5	58.00 (49.58)	50.55 (45.30)	44.45 (41.80)	41.95 (40.35)	38.88 (38.56)	32.27 (34.60)
T_{24}: G_3C_6	58.82 (50.06)	51.55 (45.87)	43.83 (41.44)	41.09 (39.85)	39.80 (39.10)	31.97 (34.42)
T_{25}: G_3C_7	63.94 (53.07)	55.00 (47.85)	48.23 (43.97)	43.00 (40.96)	38.20 (38.16)	36.00 (36.86)
T_{26}: G_3C_8	31.22 (33.96)	29.67 (32.99)	28.13 (32.02)	26.43 (30.92)	25.00 (29.99)	15.67 (23.31)
T_{27}: G_3C_9	30.00 (33.20)	29.37 (32.80)	27.43 (31.57)	25.68 (30.44)	24.00 (29.32)	13.00 (21.13)
Mean	48.10 (43.89)	42.41 (40.62)	37.44 (37.71)	34.42 (35.91)	32.99 (35.04)	27.15 (31.39)
S.Em±	7.18	8.576	10.196	11.80	12.616	10.413
CD at (1%)	21.54	25.73	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

cent, respectively. Lower percentage of dormant seeds was noticed in G_3 where in, the dormant percentage varied from 47.71 at the beginning to 26.71 per cent after 49 days of storage period.

Due to chemicals

Dormant seed percentage of seeds significantly differed between the chemicals till 35 days of storage period. Higher seed dormant percentage (64.85) was recorded in the C_2 at the beginning to 35.96 per cent till 35th day storage period, followed by C7 from 63.34 to 36.59 per cent and lower in C_1(control) from 5.22 to 8.63 per cent till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Significant difference of dormant seed percentage due to interaction effect of dormancy inducing chemicals and genotypes of seed was noticed in initial and 7th day of storage with higher percentage (65.00%) of seed dormancy in G_2C_2 and lower seed percent of seed dormancy in G_2C_1 with 4.67.

4.1.3.3 Root length (cm)

The results on root length of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 14

With the advancement of storage period, root length was increased drastically irrespective of the treatments except with C_1 (control) treatment combination.

Due to genotype

Root length of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher root length throught the storage period and recorded 11.46 cm at the beginning to 15.69 cm till the end of

Table 14. Effect of foliar spray of dormancy inducing chemicals on the root length (cm) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Root length (cm)					
	0	7	14	21	28	35
G_1	11.25	12.59	13.30	14.02	14.95	15.45
G_2	11.46	12.78	13.48	14.32	15.22	15.69
G_3	11.12	12.52	13.27	14.00	14.88	15.12
S.Em±	0.07	0.083	0.106	0.13	0.176	0.073
CD at (1%)	0.21	0.25	0.32	0.39	0.53	0.22
Chemical						
C_1	15.02	14.84	14.56	14.08	13.91	13.83
C_2	9.94	11.96	12.63	13.76	14.5	14.47
C_3	10.1	11.91	12.84	13.68	14.72	15.34
C_4	10.45	11.98	12.89	13.82	14.87	15.41
C_5	10.87	12.03	12.95	13.85	14.99	15.58
C_6	11.02	12.10	13.00	13.94	15.00	15.65
C_7	9.99	11.86	13.04	13.74	14.85	15.03
C_8	11.21	12.21	13.07	14.16	15.00	15.71
C_9	11.32	12.28	13.19	14.21	15.14	15.77
S.Em±	0.190	0.200	0.214	0.235	0.227	0.246
CD at (1%)	0.54	0.6	0.64	0.68	0.72	0.74
Interaction						
T_1: G_1C_1	15.30	15.18	14.85	14.60	14.23	13.91
T_2: G_1C_2	9.89	11.75	12.52	13.42	14.21	14.5
T_3: G_1C_3	10.09	11.93	12.83	13.65	14.72	15.35
T_4: G_1C_4	10.31	11.99	12.89	13.83	14.9	15.4
T_5: G_1C_5	10.86	12.04	12.95	13.85	14.99	15.59
T_6: G_1C_6	10.99	12.10	13.00	13.95	15.00	15.66
T_7: G_1C_7	9.98	11.81	12.79	13.52	14.65	15.31
T_8: G_1C_8	11.21	12.19	13.09	14.50	15.00	15.71
T_9: G_1C_9	11.30	12.28	13.18	14.23	15.2	15.76
T_{10}: G_2C_1	16.62	16.49	16.17	15.85	15.54	15.21
T_{11}: G_2C_2	9.82	11.57	12.85	14.48	15.29	14.92
T_{12}: G_2C_3	10.22	11.94	12.85	13.75	14.76	16.35
T_{13}: G_2C_4	10.80	12.00	12.90	13.83	14.90	15.47
T_{14}: G_2C_5	10.95	12.06	13.00	13.86	14.99	15.63
T_{15}: G_2C_6	11.10	12.10	13.00	13.99	15.00	15.66
T_{16}: G_2C_7	10.20	12.00	13.57	14.21	15.28	15.68
T_{17}: G_2C_8	11.23	12.25	13.12	14.00	15.00	15.75
T_{18}: G_2C_9	11.40	12.29	13.20	14.31	15.20	15.79
T_{19}: G_3C_1	15.20	15.00	14.67	14.49	14.09	13.70
T_{20}: G_3C_2	9.79	11.57	12.51	13.37	14.00	14.00
T_{21}: G_3C_3	10.00	11.87	12.83	13.64	14.69	14.32
T_{22}: G_3C_4	10.25	11.95	12.88	13.8	14.82	15.37
T_{23}: G_3C_5	10.81	12.00	12.91	13.85	14.99	15.53
T_{24}: G_3C_6	10.96	12.09	13.00	13.89	15.00	15.63
T_{25}: G_3C_7	9.65	11.78	12.75	13.5	14.61	14.10
T_{26}: G_3C_8	11.20	12.18	13.00	13.99	15.00	15.67
T_{27}: G_3C_9	11.25	12.27	13.18	14.1	15.03	15.76
Mean	11.28	12.63	13.35	14.11	15.02	15.42
S.Em±	3.25	3.512	1.550	1.567	0.922	0.763
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm ,

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

storage period, followed by G_1 from 11.25 to 15.45 cm, respectively. Lower percentage of root length was noticed in G_3 wherein, the root length varied from 11.12 at the beginning to 15.12 after 35 days of storage period.

Due to chemicals

Root length of seeds significantly differed between the chemicals till 35 days of storage period. Higher root length (15.02) was recorded in the C_1 (control) at the beginning to 13.83 per cent after 35 days of storage period, followed by C_9 from 11.32 to 15.77 cm and lower in C_2 from 9.94 to 14.47 till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of root length of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher root length 16.62cm at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 15.3 while, lower root length of 9.79 was observed in G_3C_2 at the beginning of storage period.

4.1.3.4 Shoot length (cm)

The results on shoot length of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 15.

With the advancement of storage period, root length was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Shoot length of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher shoot length thought the storage period and recorded 9.99 cm at the beginning to 12.62 cm till the end of

Table 15. Effect of foliar spray of dormancy inducing chemicals on the shoot length (cm) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Shoot length(cm)					
	0	7	14	21	28	35
G_1	9.60	10.46	10.79	11.22	11.93	12.47
G_2	9.99	10.76	10.96	11.18	12.04	12.62
G_3	9.33	10.24	10.60	11.08	11.80	12.32
S.Em±	0.070	0.077	0.179	0.082	0.090	0.049
CD at (1%)	0.23	0.29	0.137	0.31	0.30	0.15
Chemical						
C_1	12.92	12.98	12.23	12.01	11.76	11.74
C_2	8.38	9.64	10.37	10.86	11.60	12.40
C_3	8.56	9.80	10.43	10.92	11.84	12.49
C_4	8.75	9.91	10.49	10.99	11.98	12.57
C_5	8.91	9.98	10.56	11.10	12.05	12.62
C_6	9.17	10.00	10.59	10.88	12.16	12.85
C_7	8.49	9.75	10.38	10.56	11.77	12.47
C_8	9.41	10.15	10.64	11.30	12.20	13.12
C_9	9.17	10.18	10.55	11.17	12.27	12.96
S.Em±	1.153	0.167	0.174	0.190	0.193	0.203
CD at (1%)	0.46	0.50	0.52	0.54	0.58	0.61
Interaction						
T_1: G_1C_1	12.89	11.56	11.04	11.84	11.45	11.76
T_2: G_1C_2	8.13	9.66	10.34	10.87	11.62	12.37
T_3: G_1C_3	8.55	9.81	10.45	10.95	11.91	12.50
T_4: G_1C_4	8.72	9.91	10.50	11.00	11.99	12.58
T_5: G_1C_5	8.89	9.99	10.56	11.14	12.00	12.61
T_6: G_1C_6	9.21	10.00	10.59	11.15	12.16	12.89
T_7: G_1C_7	8.43	9.75	10.38	10.88	11.78	12.48
T_8: G_1C_8	9.30	10.19	10.61	11.27	12.20	13.01
T_9: G_1C_9	9.32	10.24	10.67	11.37	12.26	13.02
T_{10}: G_2C_1	13.54	13.50	13.23	12.70	12.21	11.71
T_{11}: G_2C_2	9.00	9.97	10.55	11.11	11.98	12.67
T_{12}: G_2C_3	8.91	9.81	10.45	11.10	11.95	12.70
T_{13}: G_2C_4	8.87	10.20	11.04	10.99	11.99	12.60
T_{14}: G_2C_5	8.97	10.50	10.57	11.15	12.14	12.66
T_{15}: G_2C_6	9.21	10.00	10.60	10.46	12.16	12.96
T_{16}: G_2C_7	8.82	10.13	10.83	11.00	11.92	12.68
T_{17}: G_2C_8	9.85	10.21	10.67	11.34	12.23	13.34
T_{18}: G_2C_9	9.75	10.55	10.32	10.81	12.30	13.03
T_{19}: G_3C_1	12.34	12.07	11.63	11.20	11.72	11.16
T_{20}: G_3C_2	8.00	9.29	10.22	10.59	11.21	12.16
T_{21}: G_3C_3	8.22	9.79	10.40	10.71	11.66	12.28
T_{22}: G_3C_4	8.65	9.61	9.94	10.97	11.95	12.52
T_{23}: G_3C_5	8.87	9.46	10.55	11.00	12.00	12.60
T_{24}: G_3C_6	9.10	10.00	10.59	11.02	12.15	12.70
T_{25}: G_3C_7	8.23	9.36	9.94	10.88	11.61	12.25
T_{26}: G_3C_8	9.09	10.04	10.64	11.28	12.18	13.00
T_{27}: G_3C_9	8.45	9.74	10.66	11.33	12.24	12.84
Mean	9.64	10.49	10.78	11.16	11.92	12.47
S.Em±	3.76	6.161	3.842	3.115	0.262	1.021
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm ,

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

storage period, followed by G_1 from 9.60 to 12.47 cm, respectively. Lower percentage of shoot length was noticed in G_3 wherein, the shoot length varied from 9.33 at the beginning to 12.32 after 35 days of storage period.

Due to chemicals

Shoot length of seeds significantly differed between the chemicals till 35 days of storage period. Higher shoot length (12.92) was recorded in the C_1 (control) at the beginning to 11.74 per cent after 35 days of storage period, followed by C_9 from 9.17 to 12.96 and lower in C_2 from 8.38 to 12.40 till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of shoot length of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher shoot length 13.54 cm at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 12.89 while, lower root length of 8.00cm was observed in G_3C_2 at the beginning of storage period.

4.1.3.5 Seedling dry weight (mg)

The results on seedling dry weight of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 16.

With the advancement of storage period, seedling dry weight was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Seedling dry weight of seeds differed significantly between the genotypes in all days of storage period

Among all the three genotypes, G_2 was registered higher seedling dry weight thought the storage period and recorded 49.70 (mg) at the beginning to 59.98 (mg) till

Table 16. Effect of foliar spray of dormancy inducing chemicals on the seedling dry weight (mg) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Seedling dry weight(mg)					
	0	7	14	21	28	35
G_1	49.37	52.79	56.08	57.93	59.14	59.74
G_2	49.70	53.09	56.31	58.17	59.37	59.98
G_3	49.01	52.62	55.88	57.73	58.93	59.47
S.Em±	0.102	0.155	0.175	0.112	0.058	0.042
CD at (1%)	0.31	0.47	0.53	0.34	0.18	0.13
Chemical						
C_1	55.91	55.16	54.98	54.00	54.70	53.42
C_2	45.91	50.53	54.65	57.03	59.23	59.97
C_3	47.09	51.46	55.44	57.49	59.22	60.06
C_4	47.73	51.74	55.73	57.68	59.33	60.12
C_5	48.12	52.01	55.92	57.94	59.43	60.21
C_6	48.70	52.49	56.21	58.41	59.67	60.31
C_7	46.34	50.65	54.97	57.23	59.11	60.06
C_8	49.52	53.06	56.40	58.81	59.79	60.62
C_9	50.90	53.40	56.53	58.94	59.84	60.80
S.Em±	0.791	0.849	0.904	0.934	0.953	0.970
CD at (1%)	2.37	2.54	2.71	2.80	2.86	2.90
Interaction						
T_1: G_1C_1	56.02	56.20	55.98	55.74	55.76	55.40
T_2: G_1C_2	45.95	50.25	54.60	57.02	59.05	60.01
T_3: G_1C_3	47.00	51.62	55.30	57.57	59.21	60.09
T_4: G_1C_4	47.73	51.73	55.75	57.65	59.30	60.10
T_5: G_1C_5	48.17	52.00	55.95	58.00	59.47	60.21
T_6: G_1C_6	48.79	52.40	56.25	58.31	59.68	60.30
T_7: G_1C_7	46.34	50.57	54.98	57.25	59.15	60.07
T_8: G_1C_8	49.52	53.05	56.38	58.82	59.79	60.70
T_9: G_1C_9	49.88	53.49	56.52	58.95	59.84	60.81
T_{10}: G_2C_1	57.26	57.00	56.60	56.20	55.43	54.56
T_{11}: G_2C_2	46.41	50.70	54.95	57.36	59.45	60.45
T_{12}: G_2C_3	47.30	51.65	55.71	57.82	59.56	61.01
T_{13}: G_2C_4	48.15	51.81	55.79	57.75	59.50	60.18
T_{14}: G_2C_5	48.25	52.12	56.20	58.00	59.49	60.23
T_{15}: G_2C_6	48.80	52.86	56.31	58.61	59.74	60.37
T_{16}: G_2C_7	46.91	50.98	55.35	57.66	59.43	60.48
T_{17}: G_2C_8	49.80	53.12	56.78	58.95	59.83	60.74
T_{18}: G_2C_9	50.42	53.57	56.54	59.21	60.16	60.82
T_{19}: G_3C_1	56.56	55.89	54.77	54.97	54.15	54.51
T_{20}: G_3C_2	45.38	50.64	54.40	56.71	59.19	59.45
T_{21}: G_3C_3	46.97	51.12	55.30	57.09	58.88	59.07
T_{22}: G_3C_4	47.30	51.68	55.66	57.63	59.19	60.09
T_{23}: G_3C_5	47.95	51.90	55.62	57.82	59.32	60.20
T_{24}: G_3C_6	48.50	52.20	56.07	58.30	59.59	60.25
T_{25}: G_3C_7	45.77	50.41	54.57	56.77	58.75	59.63
T_{26}: G_3C_8	49.23	53.00	56.04	58.65	59.75	60.42
T_{27}: G_3C_9	49.40	53.14	56.52	58.65	59.52	60.78
Mean	49.36	52.83	56.09	57.95	59.15	59.73
S.Em±	5.891	4.512	1.8443	0.846	1.461	1.971
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

the end of storage period, followed by G_1 from 49.37 to 59.74 (mg), respectively. Lower percentage of seedling dry weight was noticed in G_3 wherein, the seedling dry weight varied from 49.01 mg at the beginning to 59.47 mg after 35 days of storage period.

Due to chemicals

Seedling dry weight of seeds significantly differed between the chemicals till 35 days of storage period. Higher seedling dry weight (55.91mg) was recorded in the C_1 (control) at the beginning to 53.42 mg after 35 days of storage period, followed by C_9 from 50.90 to 60.80 mg and lower in C_2 from 45.91 to59.97mg, mg till 49 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of seedling dry weight of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher seedling dry weight 57.26 mg at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 56.02 mg while, lower seedling dry weight of 45.38mg was observed in G_3C_2 at the beginning of storage period.

4.1.3.6 Seedling vigour index

The results on seedling vigour index of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 17.

With the advancement of storage period, seedling vigour index was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Seedling vigour index of seeds differed significantly between the genotypes in all days of storage period.

Table 17. Effect of foliar spray of dormancy inducing chemicals on the seedling vigour index in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Seedling vigour index					
	0	7	14	21	28	35
G_1	1081	1327	1506	1654	1802	2056
G_2	1104	1346	1520	1662	1806	2040
G_3	1069	1320	1484	1635	1806	2011
S.Em±	5.658	3.846	4.193	3.78	6.55	9.18
CD at (1%)	16.97	11.54	12.58	11.34	19.65	27.56
Chemical						
C_1	2648	2631	2476	2439	2366	2336
C_2	617	960	1170	1398	1566	1720
C_3	703	1013	1273	1417	1655	1827
C_4	755	1048	1290	1440	1644	1882
C_5	845	1096	1310	1456	1638	1913
C_6	838	1079	1325	1462	1631	1944
C_7	675	990	1236	1396	1621	1743
C_8	1425	1574	1709	1884	2067	2371
C_9	1434	1589	1730	1915	1940	2515
S.Em±	37.556	45.713	46.103	53.343	57.393	65.726
CD at (1%)	112.67	137.14	138.31	160.03	172.18	197.18
Interaction						
T_1: G_1C_1	2678	2531	2442	2472	2401	2392
T_2: G_1C_2	637	960	1160	1374	1498	1757
T_3: G_1C_3	698.	1015	1280	1418	1651	1865
T_4: G_1C_4	743	1053	1289	1441	1649	1880
T_5: G_1C_5	851	1092	1305	1461	1637	1911
T_6: G_1C_6	836	1083	1325	1478	1629	1942
T_7: G_1C_7	674	991	1228	1395	1559	1764
T_8: G_1C_8	1412	1574	1703	1905	2040	2441
T_9: G_1C_9	1443	1590	1738	1940	2114	2522
T_{10}: G_2C_1	2875	2852	2793	2697	2401	2392
T_{11}: G_2C_2	655	998	1202	1458	1636	1703
T_{12}: G_2C_3	730	1025	1281	1441	1682	1830
T_{13}: G_2C_4	786	1072	1324	1440	1640	1893
T_{14}: G_2C_5	859	1137	1323	1466	1627	1924
T_{15}: G_2C_6	852	1084	1328	1442	1629	1963
T_{16}: G_2C_7	708	1029	1309	1467	1686	1779
T_{17}: G_2C_8	1469	1586	1725	1887	2123	2253
T_{18}: G_2C_9	1481	1621	1722	1917	1631	2536
T_{19}: G_3C_1	2588	2541	2452	2389	2397	2297
T_{20}: G_3C_2	623	923	1150	1360	1563	1700
T_{21}: G_3C_3	681	999	1257	1393	1634	1780
T_{22}: G_3C_4	738	1019	1258	1437	1642	1874
T_{23}: G_3C_5	826	1061	1303	1442	1649	1905
T_{24}: G_3C_6	826	1070	1325	1467	1634	1927
T_{25}: G_3C_7	644	951	1174	1389	1620	1686
T_{26}: G_3C_8	1395	1562	1699	1859	2038	2417
T_{27}: G_3C_9	1379	1554	1730	1889	2072	2488
Mean	1006.25	980.52	903.43	869.79	888.75	757.21
S.Em±	803.77	651.577	509.425	455.230	331.992	221.260
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Among all the three genotypes, G_2 was registered higher seedling vigour index thought the storage period and recorded 1104 at the beginning to 2040 till the end of storage period, followed by G_1 from 1081 to 2056, respectively. Lower seedling vigour index was noticed in G_3 wherein, the seedling vigour index varied from 1069 at the beginning to 2011 after 35 days of storage period.

Due to chemicals

Seedling vigour index of seeds significantly differed between the chemicals till 35 days of storage period. Higher seedling vigour index (2648) was recorded in the C_1 (control) at the beginning to 2336 after 35 days of storage period, followed by C_9 from 1434 to 2515 and lower in C_2 from 617 to 1720 till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of seedling vigour index of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher seedling vigour index 2875 at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 2678 while, lower seedling vigour index of 623 was observed in G_3C_2 at the beginning of storage period.

4.1.3.7 Rate of germination

The results on rate of germination of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 18.

With the advancement of storage period, rate of germination was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Rate of germination of seeds differed significantly between the genotypes in all days of storage period.

Table 18. Effect of foliar spray of dormancy inducing chemicals on the rate of germination in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Rate of germination					
	0	7	14	21	28	35
G_1	17.80	19.08	19.72	20.31	21.07	22.47
G_2	18.35	19.28	19.94	20.42	21.20	22.68
G_3	17.54	18.82	19.51	19.98	20.96	22.36
S.Em±	0.078	0.141	0.102	0.070	0.075	0.990
CD at (1%)	0.24	0.43	0.31	0.21	0.23	0.30
Chemical						
C_1	23.73	23.27	22.08	21.62	20.89	19.95
C_2	16.15	18.03	18.84	19.36	20.81	22.59
C_3	16.94	18.40	19.51	20.09	20.98	22.77
C_4	17.18	18.51	19.39	20.21	21.01	22.89
C_5	17.46	18.62	19.51	20.30	21.24	22.99
C_6	17.54	18.74	19.59	20.39	21.41	23.03
C_7	16.48	18.27	19.15	20.01	20.93	22.65
C_8	17.68	18.81	19.68	20.52	21.62	23.16
C_9	17.88	18.89	19.76	20.63	21.79	23.47
S.Em±	0.283	0.307	0.316	0.327	0.340	0.370
CD at (1%)	0.85	0.92	0.95	0.98	1.02	1.10
Interaction						
T_1: G_1C_1	23.73	23.28	23.08	22.68	21.58	21.49
T_2: G_1C_2	15.15	18.17	19.00	19.99	20.78	22.60
T_3: G_1C_3	17.00	18.43	19.34	20.10	20.98	22.78
T_4: G_1C_4	17.23	18.54	19.35	20.20	21.00	22.86
T_5: G_1C_5	17.46	18.61	19.50	20.28	21.23	22.99
T_6: G_1C_6	17.54	18.75	19.60	20.39	21.41	23.00
T_7: G_1C_7	16.50	18.26	19.21	20.00	20.94	22.65
T_8: G_1C_8	17.67	18.78	19.69	20.52	21.64	23.15
T_9: G_1C_9	17.90	18.89	19.75	20.62	21.80	23.21
T_{10}: G_2C_1	24.04	23.70	23.64	22.72	21.77	21.60
T_{11}: G_2C_2	18.79	18.61	19.53	20.30	21.10	22.81
T_{12}: G_2C_3	16.94	18.43	19.64	20.30	20.98	22.80
T_{13}: G_2C_4	17.31	18.86	19.47	20.25	21.04	22.96
T_{14}: G_2C_5	17.48	18.69	19.54	20.36	21.30	23.00
T_{15}: G_2C_6	17.59	18.76	19.60	20.42	21.48	23.08
T_{16}: G_2C_7	17.01	18.62	19.53	20.24	21.21	22.97
T_{17}: G_2C_8	17.76	18.97	19.69	20.54	21.67	23.20
T_{18}: G_2C_9	18.22	18.89	19.81	20.65	21.87	24.00
T_{19}: G_3C_1	23.42	23.14	22.63	21.47	21.63	20.97
T_{20}: G_3C_2	14.51	17.30	18.00	17.79	20.55	22.37
T_{21}: G_3C_3	16.88	18.35	19.55	19.87	20.97	22.74
T_{22}: G_3C_4	17.00	18.13	19.34	20.17	20.99	22.86
T_{23}: G_3C_5	17.45	18.57	19.50	20.25	21.20	22.99
T_{24}: G_3C_6	17.50	18.71	19.57	20.37	21.35	23.00
T_{25}: G_3C_7	15.94	17.94	18.70	19.80	20.65	22.32
T_{26}: G_3C_8	17.60	18.68	19.66	20.49	21.55	23.14
T_{27}: G_3C_9	17.52	18.88	19.72	20.61	21.71	23.21
Mean	17.89	19.06	19.72	20.24	21.08	22.50
S.Em±	3.326	2.242	1.831	0.416	0.831	1.623
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Among all the three genotypes, G_2 was registered higher rate of germination thought the storage period and recorded 18.35 at the beginning to 22.68 till the end of storage period, followed by G_1 from 17.80 to 22.47, respectively. Lower rate of germination was noticed in G_3 wherein, the rate of germination varied from 17.54 at the beginning to 22.36 after 35 days of storage period.

Due to chemicals

Rate of germination of seeds significantly differed between the chemicals till 35 days of storage period. Higher rate of germination (23.73)was recorded in the C_1 (control) at the beginning to 19.95 after 35 days of storage period, followed by C_9 from 17.88 to 23.47 and lower in C_2 from 16.15 to 22.59 till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of rate of germination of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher rate of germination 24.04 at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 23.73 while, lower rate of germination of 14.51 was observed in G_3C_2 at the beginning of storage period.

4.1.3.8 Seed infestation (%)

The results on seed infestation of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 19

With the advancement of storage period, seed infestation was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Seed infestation of seeds differed significantly between the genotypes in all days of storage period.

Table 19. Effect of foliar spray of dormancy inducing chemicals on the insect infestation (%) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Insect infestation (%)					
	0	7	14	21	28	35
G_1	1.63	2.38	2.97	3.68	4.83	6.46
G_2	1.77	2.49	3.03	3.73	4.92	6.58
G_3	1.56	2.26	2.82	3.54	4.65	6.22
S.Em±	0.028	0.039	0.037	0.042	0.041	0.065
CD at (1%)	0.10	0.12	0.12	0.13	0.13	0.21
Chemical						
C_1	2.70	3.27	3.82	4.67	4.83	5.74
C_2	0.00	1.77	2.24	2.89	3.69	5.15
C_3	1.25	1.81	2.29	3.08	3.92	5.59
C_4	1.72	2.23	2.74	3.45	4.04	6.07
C_5	1.93	2.43	3.01	3.68	4.75	6.53
C_6	2.01	2.45	3.11	3.70	4.88	6.68
C_7	1.14	1.75	2.32	2.90	3.96	5.44
C_8	2.13	2.53	3.18	3.93	5.05	6.99
C_9	2.67	3.14	3.74	4.57	5.71	7.59
S.Em±	0.06	0.07	0.08	009	0.11	0.136
CD at (1%)	0.18	0.21	0.24	0.27	0.33	0.41
Interaction						
T_1: G_1C_1	2.7	3.21	3.88	4.71	6.04	7.90
T_2: G_1C_2	0.00	1.71	2.22	2.89	3.79	5.10
T_3: G_1C_3	1.18	1.79	2.38	3.08	4.04	5.54
T_4: G_1C_4	1.88	2.40	2.90	3.63	4.57	6.29
T_5: G_1C_5	1.92	2.43	3.04	3.68	4.88	6.54
T_6: G_1C_6	2.04	2.46	3.08	3.71	5.04	6.71
T_7: G_1C_7	1.14	1.74	2.32	2.99	4.00	5.46
T_8: G_1C_8	2.14	2.54	3.21	3.88	5.20	7.04
T_9: G_1C_9	2.67	3.12	3.74	4.62	5.88	7.54
T_{10}: G_2C_1	2.70	3.41	3.88	4.85	6.04	7.81
T_{11}: G_2C_2	0.00	1.86	2.49	2.99	3.98	5.41
T_{12}: G_2C_3	1.38	1.98	2.30	3.10	4.16	5.71
T_{13}: G_2C_4	1.90	2.50	2.92	3.64	4.75	6.38
T_{14}: G_2C_5	1.96	2.45	3.05	3.81	4.99	6.6
T_{15}: G_2C_6	2.05	2.46	3.20	3.71	5.10	6.79
T_{16}: G_2C_7	1.15	1.87	2.45	2.89	4.00	5.69
T_{17}: G_2C_8	2.15	2.68	3.21	4.04	5.41	7.24
T_{18}: G_2C_9	2.69	3.19	3.75	4.54	5.88	7.63
T_{19}: G_3C_1	2.70	3.21	3.72	4.45	5.83	7.51
T_{20}: G_3C_2	0.00	1.73	2.02	2.78	3.69	4.93
T_{21}: G_3C_3	1.21	1.67	2.18	3.06	3.92	5.51
T_{22}: G_3C_4	1.38	1.78	2.39	3.08	4.04	5.54
T_{23}: G_3C_5	1.91	2.42	2.96	3.55	4.75	6.46
T_{24}: G_3C_6	1.96	2.44	3.04	3.68	4.88	6.54
T_{25}: G_3C_7	1.13	1.63	2.19	2.81	3.96	5.18
T_{26}: G_3C_8	2.10	2.36	3.13	3.88	5.05	6.68
T_{27}: G_3C_9	2.65	3.10	3.73	4.54	5.71	7.6
Mean	1.65	2.37	2.94	3.65	4.65	6.42
S.Em±	1.322	0.621	0.73	0.74	0.81	1.02
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Among all the three genotypes, G_3 have given higher seed infestation thought the storage period and recorded 1.56 at the beginning to 6.22 per cent till the end of storage period, followed by G_1 from 1.63 to 6.46 per cent, respectively. Lower insect infestation was noticed in G_2 wherein, the seed infestation varied from 1.77 at the beginning to 6.58 per cent after 35 days of storage period.

Due to chemicals

Seed infestation of seeds significantly differed between the chemicals till 35 days of storage period. Higher seed infestation (2.7 per cent)was recorded in the C_1 (control) at the beginning to 5.74 per cent after 35 days of storage period, followed by C_9 from 2.67 to 7.59 per cent and lower in C_2 from zero to 5.15 per cent till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of seed infestation of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher seed infestation 2.70 per cent at the beginning of storage period was recorded in G_1C_1 and G_3C_1 while, seed infestation of zero per cent was observed in G_3C_2 and G_1C_2 at the beginning of storage period.

4.1.3.9 Seed infection (%)

The results on seed infection of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 20

With the advancement of storage period, seed infection was increased drastically irrespective of the treatments except with C_1 (control) treatment combination.

Table 20. Effect of foliar spray of dormancy inducing chemicals on the disease infection (%) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Disease infection (%)					
	0	7	14	21	28	35
G_1	0.80	1.44	1.96	2.74	3.88	5.51
G_2	0.83	1.51	2.10	2.81	3.98	5.58
G_3	0.72	1.29	1.95	2.61	3.71	5.34
S.Em±	0.014	0.018	0.022	0.049	0.039	0.049
CD at (1%)	0.05	0.07	0.08	0.15	0.12	0.15
Chemical						
C_1	1.70	2.21	2.85	3.67	5.03	6.77
C_2	0.00	0.72	1.24	1.91	2.82	4.15
C_3	0.25	1.01	1.55	2.07	3.04	4.53
C_4	0.89	1.20	1.75	2.62	3.62	5.29
C_5	0.92	1.43	2.00	2.68	3.87	5.53
C_6	1.01	1.45	2.07	2.70	4.01	5.68
C_7	0.14	0.73	1.32	2.00	2.99	4.43
C_8	1.46	1.86	2.52	3.26	4.52	6.34
C_9	1.67	2.13	2.73	3.57	4.82	6.57
S.Em±	0.03	0.04	0.05	0.06	0.07	0.103
CD at (1%)	0.09	0.12	0.15	0.18	0.23	0.31
Interaction						
T_1: G_1C_1	1.70	2.21	2.88	3.71	5.04	6.90
T_2: G_1C_2	0.00	0.73	1.22	1.90	2.79	4.13
T_3: G_1C_3	0.21	0.88	1.38	2.08	3.04	4.54
T_4: G_1C_4	0.90	1.40	1.39	2.60	3.54	5.21
T_5: G_1C_5	0.92	1.43	1.92	2.68	3.88	5.54
T_6: G_1C_6	1.04	1.46	2.08	2.71	4.04	5.71
T_7: G_1C_7	0.14	0.74	1.32	1.99	3.00	4.46
T_8: G_1C_8	1.64	2.04	2.71	3.38	4.70	6.54
T_9: G_1C_9	1.67	2.12	2.74	3.62	4.88	6.54
T_{10}: G_2C_1	1.60	2.21	2.88	3.75	5.14	6.81
T_{11}: G_2C_2	0.00	0.71	1.22	1.99	2.89	4.30
T_{12}: G_2C_3	0.38	1.38	1.90	2.08	3.04	4.64
T_{13}: G_2C_4	0.91	1.40	1.96	2.74	3.85	5.38
T_{14}: G_2C_5	0.96	1.45	2.05	2.71	3.99	5.60
T_{15}: G_2C_6	1.05	1.46	2.10	2.81	4.10	5.79
T_{16}: G_2C_7	0.15	0.74	1.35	2.14	3.10	4.49
T_{17}: G_2C_8	1.65	2.10	2.73	3.54	4.71	6.60
T_{18}: G_2C_9	1.69	2.19	2.75	3.54	4.98	6.63
T_{19}: G_3C_1	1.70	2.21	2.79	3.55	4.90	6.61
T_{20}: G_3C_2	0.00	0.73	1.29	1.83	2.77	4.01
T_{21}: G_3C_3	0.18	0.79	1.38	2.06	3.04	4.41
T_{22}: G_3C_4	0.88	0.79	1.90	2.53	3.47	5.29
T_{23}: G_3C_5	0.88	1.42	2.04	2.65	3.75	5.46
T_{24}: G_3C_6	0.96	1.44	2.04	2.58	3.88	5.54
T_{25}: G_3C_7	0.13	0.73	1.29	1.86	2.86	4.34
T_{26}: G_3C_8	1.10	1.46	2.13	2.88	4.15	5.88
T_{27}: G_3C_9	1.65	2.08	2.71	3.54	4.61	6.54
Mean	0.78	1.42	2.00	2.72	3.86	5.48
S.Em±	0.93	0.56	0.62	0.34	0.91	1.02
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm ,

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to genotype

Seed infection of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 have given higher seed infection thought the storage period and recorded 0.83 at the beginning to 5.58 per cent till the end of storage period, followed by G_1 from 0.80 to 5.51 per cent, respectively. Lower seed infection was noticed in G_3 wherein, the seed infection varied from 0.72 at the beginning to 5.34 per cent after 35 days of storage period.

Due to chemicals

Seed infection of seeds significantly differed between the chemicals till 35 days of storage period. Higher seed infection (1.70 per cent)was recorded in the C_1 (control) at the beginning to 6.77 per cent after 35 days of storage period, followed by C_9 from 1.67 to 6.57 per cent and lower in C_2 from zero to 4.15 per cent till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of seed infection of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher seed infection 1.70 per cent at the beginning of storage period was recorded in G_1C_1 and G_3C_1 while, seed infection of zero per cent was observed in G_1C_2, G_2C_2 and G_3C_2 at the beginning of storage period.

4.1.3.10 Moisture content (%)

The results on moisture content of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 21

With the advancement of storage period, moisture content was decreased drastically irrespective of the treatments.

Table 21. Effect of foliar spray of dormancy inducing chemicals on the moisture content (%) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Moisture content (%)					
	0	7	14	21	28	35
G_1	11.77	11.47	11.24	11.10	10.99	10.82
G_2	11.88	11.49	11.26	11.12	11.01	10.84
G_3	11.61	11.46	11.23	11.09	10.98	10.81
S.Em±	0.036	0.096	0.093	0.089	0.086	0.082
CD at (1%)	NS	NS	NS	NS	NS	NS
Chemical						
C_1	12.35	11.68	11.51	11.26	11.15	11.02
C_2	11.42	11.3	10.99	10.93	10.82	10.64
C_3	11.53	11.39	11.13	11.03	10.92	10.72
C_4	11.61	11.41	11.18	11.04	10.93	10.75
C_5	11.73	11.47	11.21	11.08	10.97	10.80
C_6	11.78	11.53	11.26	11.15	11.04	10.87
C_7	11.50	11.35	11.03	10.99	10.88	10.66
C_8	11.76	11.57	11.41	11.20	11.09	10.94
C_9	11.68	11.58	11.47	11.23	11.12	10.99
S.Em±	0.122	0.166	0.161	0.154	0.148	0.142
CD at (1%)	NS	NS	NS	NS	NS	NS
Interaction						
T_1: G_1C_1	12.40	11.67	11.51	11.26	11.15	11.02
T_2: G_1C_2	11.42	11.29	10.99	10.93	10.82	10.65
T_3: G_1C_3	11.52	11.38	11.13	11.03	10.92	10.72
T_4: G_1C_4	11.61	11.41	11.18	11.04	10.93	10.74
T_5: G_1C_5	11.73	11.46	11.20	11.05	10.94	10.79
T_6: G_1C_6	11.78	11.54	11.25	11.16	11.05	10.86
T_7: G_1C_7	11.50	11.34	11.03	11.01	10.90	10.66
T_8: G_1C_8	11.88	11.57	11.42	11.20	11.09	10.96
T_9: G_1C_9	12.09	11.58	11.47	11.23	11.12	10.99
T_{10}: G_2C_1	12.50	11.69	11.52	11.28	11.17	11.03
T_{11}: G_2C_2	11.65	11.33	11.00	10.93	10.82	10.65
T_{12}: G_2C_3	11.75	11.40	11.15	11.03	10.92	10.73
T_{13}: G_2C_4	11.81	11.43	11.19	11.04	10.93	10.78
T_{14}: G_2C_5	11.75	11.50	11.24	11.12	11.01	10.83
T_{15}: G_2C_6	11.80	11.55	11.28	11.17	11.06	10.88
T_{16}: G_2C_7	11.71	11.37	11.06	11.02	10.91	10.66
T_{17}: G_2C_8	11.76	11.57	11.43	11.21	11.10	10.97
T_{18}: G_2C_9	12.15	11.59	11.50	11.25	11.14	11.01
T_{19}: G_3C_1	12.15	11.67	11.50	11.25	11.14	11.01
T_{20}: G_3C_2	11.20	11.29	10.99	10.92	10.81	10.61
T_{21}: G_3C_3	11.31	11.38	11.12	11.02	10.91	10.72
T_{22}: G_3C_4	11.40	11.4	11.16	11.03	10.92	10.74
T_{23}: G_3C_5	11.72	11.45	11.19	11.07	10.96	10.79
T_{24}: G_3C_6	11.77	11.51	11.25	11.13	11.02	10.86
T_{25}: G_3C_7	11.29	11.34	11.01	10.95	10.84	10.65
T_{26}: G_3C_8	11.63	11.56	11.39	11.18	11.07	10.9
T_{27}: G_3C_9	12.01	11.58	11.45	11.22	11.11	10.98
Mean	11.75	11.48	11.24	11.10	10.99	10.82
S.Em±	0.300	0.288	0.279	0.267	0.257	0.245
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to genotype

Moisture content of seeds did not showed significant difference between the genotypes in all the storage period.

Among all the three genotypes, G_2 have given moisture content in the initial day and recorded 11.88 per cent at the beginning, followed by G_1 from 11.77 per cent. Lower moisture content (11.61) was noticed in G_3 at the beginning of storage period. At further storage there was non significant difference between the genotypes

Due to chemicals

There was non significant difference with moisture content between the throught the storage period except at initial day. Higher moisture content 12.35 per cent was recorded in the C_1 (control) at the beginning, followed by C_8 (11.76%) and lower in C_2 (11.42%) at initial period.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of moisture content of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes.

4.1.3.11 Protein content (%)

The results on protein content (%) of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 22

With the advancement of storage period, protein content was decreased drastically irrespective of the treatments.

Due to genotype

Although G_2 recorded numerically high protein content (23.84%) but there was no significant difference among the genotypes.

Table 22. Effect of foliar spray of dormancy inducing chemicals on the protein % in progeny seeds of green gram genotypes

Treatment	Days of storage					
	Protein (%)					
	0	7	14	21	28	35
G_1	23.83	22.95	22.09	22.34	21.38	20.52
G_2	23.84	22.96	22.12	22.38	21.41	20.55
G_3	23.82	23.93	22.07	22.33	21.37	20.50
S.Em±	0.176	0.170	0.163	0.163	0.163	0.145
CD at (1%)	NS	NS	NS	NS	NS	NS
Chemical						
C_1	24.20	23.29	22.34	22.59	21.63	20.89
C_2	23.39	22.59	21.84	22.10	21.14	20.16
C_3	23.70	22.73	21.96	22.22	21.26	20.34
C_4	23.74	22.83	22.05	22.30	21.34	20.43
C_5	23.78	23.05	22.11	22.37	21.40	20.50
C_6	23.86	23.08	22.16	22.42	21.46	20.59
C_7	23.65	22.64	21.90	22.16	21.19	20.26
C_8	24.03	23.12	22.22	22.48	21.51	20.70
C_9	24.12	23.18	22.26	22.52	21.55	20.84
S.Em±	0.305	0.294	0.283	0.283	0.283	0.252
CD at (1%)	NS	NS	NS	NS	NS	NS
Interaction						
T_1: G_1C_1	24.19	23.31	22.33	22.59	21.62	20.90
T_2: G_1C_2	23.42	22.58	21.86	22.10	21.15	20.15
T_3: G_1C_3	23.71	22.74	21.97	22.22	21.26	20.37
T_4: G_1C_4	23.74	22.82	22.03	22.30	21.32	20.45
T_5: G_1C_5	23.79	23.06	22.12	22.37	21.41	20.51
T_6: G_1C_6	23.84	23.09	22.17	22.42	21.46	20.54
T_7: G_1C_7	23.66	22.64	21.89	22.16	21.18	20.27
T_8: G_1C_8	24.02	23.12	22.18	22.48	21.47	20.64
T_9: G_1C_9	24.12	23.17	22.24	22.52	21.53	20.82
T_{10}: G_2C_1	24.24	23.32	22.38	22.64	21.67	20.91
T_{11}: G_2C_2	23.37	22.59	21.86	22.12	21.15	20.17
T_{12}: G_2C_3	23.71	22.77	21.98	22.23	21.27	20.33
T_{13}: G_2C_4	23.75	22.86	22.08	22.34	21.37	20.46
T_{14}: G_2C_5	23.79	23.07	22.13	22.38	21.42	20.52
T_{15}: G_2C_6	23.80	23.09	22.18	22.43	21.47	20.64
T_{16}: G_2C_7	23.67	22.65	21.92	22.17	21.21	20.31
T_{17}: G_2C_8	24.07	23.13	22.25	22.50	21.54	20.76
T_{18}: G_2C_9	24.15	23.22	22.30	22.56	21.59	20.84
T_{19}: G_3C_1	24.17	23.26	22.30	22.56	21.59	20.87
T_{20}: G_3C_2	23.37	22.60	21.81	22.07	21.10	20.15
T_{21}: G_3C_3	23.69	22.69	21.94	22.20	21.23	20.32
T_{22}: G_3C_4	23.74	22.81	22.03	22.28	21.32	20.38
T_{23}: G_3C_5	23.76	23.04	22.09	22.34	21.38	20.48
T_{24}: G_3C_6	23.95	23.08	22.14	22.40	21.43	20.58
T_{25}: G_3C_7	23.62	22.63	21.89	22.14	21.18	20.21
T_{26}: G_3C_8	24.00	23.11	22.23	22.49	21.52	20.70
T_{27}: G_3C_9	24.10	23.14	22.25	22.50	21.54	20.85
Mean	23.83	29.95	22.09	22.35	21.39	20.52
S.Em±	0.528	0.509	0.490	0.490	0.490	0.436
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant S: Significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Due to chemicals

There was non significant difference with protein content between the chemicals throught the storage period. Higher protein content (24.20%) was recorded in the C_1 (control) at the beginning, followed by C_9 from 24.12 per cent and lower in C_2 (23.39%) at initial period.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of protein content of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes.

4.1.3.12 EC (dS/m)

The results on EC (dS/m) of green gram seeds as influenced by foliar spray of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 23

With the advancement of storage period, EC was decreased drastically irrespective of the treatments.

Due to genotype

EC of seeds did not showed significant difference between the genotypes in all the storage period.

Among all the three genotypes, G_2 have given high EC in the initial day and recorded 0.75 dS/m at the beginning, followed by G_1 from 0.73 dS/m. Lower EC (0.71 dS/m) was noticed in G_3 at the beginning of storage period.

Due to chemicals

There was significant difference between the chemicals. Higher EC 0.76 dS/m was recorded in the C_2 and C_7 at the beginning, followed by C_4 (0.75 dS/m) and lower in C_1 (0.72 dS/m) at initial period.

Table 23. Effect of foliar spray of dormancy inducing chemicals on the EC (dS/m) in progeny seeds of green gram genotypes

Treatment	Days of storage					
	EC (dS/m)					
	0	7	14	21	28	35
G_1	0.73	0.72	0.71	0.69	0.66	0.64
G_2	0.75	0.73	0.71	0.72	0.65	0.62
G_3	0.71	0.69	0.68	0.69	0.64	0.61
S.Em±	0.012	0.010	0.009	0.006	0.005	0.009
CD at (1%)	0.036	0.031	0.027	0.019	0.015	0.027
Chemical						
C_1	0.72	0.68	0.64	0.63	0.61	0.58
C_2	0.76	0.75	0.76	0.75	0.69	0.72
C_3	0.73	0.73	0.74	0.73	0.68	0.58
C_4	0.75	0.74	0.73	0.72	0.67	0.65
C_5	0.73	0.73	0.72	0.70	0.66	0.65
C_6	0.73	0.71	0.70	0.69	0.64	0.62
C_7	0.76	0.76	0.75	0.74	0.69	0.68
C_8	0.72	0.69	0.67	0.65	0.63	0.60
C_9	0.73	0.68	0.66	0.64	0.63	0.59
S.Em±	0.009	0.009	0.009	0.009	0.008	0.008
CD at (1%)	0.04	0.03	0.03	0.03	0.03	0.03
Interaction (GxC)						
T_1: G_1C_1	0.66	0.65	0.64	0.63	0.62	0.58
T_2: G_1C_2	0.78	0.77	0.76	0.75	0.73	0.72
T_3: G_1C_3	0.76	0.75	0.74	0.73	0.68	0.66
T_4: G_1C_4	0.75	0.74	0.73	0.72	0.67	0.65
T_5: G_1C_5	0.75	0.73	0.72	0.71	0.66	0.65
T_6: G_1C_6	0.73	0.71	0.70	0.69	0.64	0.62
T_7: G_1C_7	0.77	0.76	0.75	0.74	0.70	0.69
T_8: G_1C_8	0.72	0.69	0.67	0.65	0.63	0.59
T_9: G_1C_9	0.70	0.68	0.66	0.64	0.62	0.59
T_{10}: G_2C_1	0.73	0.73	0.65	0.64	0.63	0.59
T_{11}: G_2C_2	0.77	0.79	0.78	0.76	0.62	0.74
T_{12}: G_2C_3	0.76	0.75	0.74	0.73	0.68	0.41
T_{13}: G_2C_4	0.75	0.75	0.74	0.72	0.67	0.66
T_{14}: G_2C_5	0.74	0.73	0.72	0.71	0.66	0.65
T_{15}: G_2C_6	0.74	0.71	0.70	0.69	0.64	0.63
T_{16}: G_2C_7	0.77	0.76	0.75	0.74	0.70	0.69
T_{17}: G_2C_8	0.72	0.69	0.67	0.65	0.63	0.61
T_{18}: G_2C_9	0.76	0.68	0.66	0.65	0.64	0.59
T_{19}: G_3C_1	0.74	0.67	0.64	0.63	0.59	0.58
T_{20}: G_3C_2	0.67	0.64	0.75	0.74	0.71	0.70
T_{21}: G_3C_3	0.76	0.75	0.74	0.73	0.67	0.66
T_{22}: G_3C_4	0.75	0.74	0.73	0.71	0.67	0.65
T_{23}: G_3C_5	0.70	0.72	0.71	0.70	0.66	0.64
T_{24}: G_3C_6	0.72	0.71	0.70	0.69	0.64	0.62
T_{25}: G_3C_7	0.76	0.76	0.75	0.74	0.69	0.67
T_{26}: G_3C_8	0.72	0.69	0.67	0.65	0.63	0.59
T_{27}: G_3C_9	0.72	0.67	0.66	0.64	0.62	0.59
Mean	0.74	0.72	0.71	0.69	0.66	0.63
S.Em±	0.016	0.016	0.016	0.015	0.015	0.014
CD at (1%)	NS	NS	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of EC was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes.

4.2 Experiment – II: Influence of seed treatment by different dormancy inducing chemicals with three different genotypes on seed quality parameters of green gram seeds during storage

The results of the present investigation on influence of seed treatment with dormancy inducing chemicals on seed quality of three different genotypes of green gram under ambient storage conditions are presented in this chapter.

4.2.1 Seed germination (%)

The results on seed germination per cent of green gram seeds as influenced seed treatment with dormancy inducing chemicals in three genotypes and their interaction effect at different days of storage are presented in Table 24.

Due to genotypes

Germination percentage of seeds differed significantly between the genotypes in all months of storage period. From the data it was observed that the genotypes differed significantly in respect of germination percentage till 21 days of testing. At 0 day of testing the genotype G_3 recorded (62.36%) mean highest germination at initial and 74.28 percent at last followed by G_1 recorded61.29 to 72.68 % and 61.09 to 70.12 percent in G_2.

Due to chemicals

Germination percentage of seeds significantly differed between the seed treatment with dormancy inducing chemicals till 21 days of storage

Higher seed germination percentage (100) was recorded in the C_1 (control) , followed by C_9 with germination from 76.75 to 81.11 per cent and lower in C_2 from 45.51 to 60.87 per cent.

Table 24. Effect of different concentration of MH, PB and PEG seed treatment on seed germination (%) of green gram genotypes during storage

Treatment	Days of storage			
	Seed germination (%)			
	0	7	14	21
G_1	61.29 (51.50)	68.71 (55.96)	72.54 (58.37)	72.68 (58.46)
G_2	61.09 (51.39)	66.94 (54.88)	71.23 (57.54)	70.12 (56.84)
G_3	62.36 (52.13)	68.42 (55.79)	72.21 (58.16)	74.28 (59.50)
S.Em±	0.166	0.18	0.243	0.276
CD at (1%)	0.50	0.54	0.73	0.83
Chemicals				
C_1	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)
C_2	45.51 (42.41)	56.88 (48.93)	59.65 (50.54)	60.87 (51.26)
C_3	52.67 (46.51)	60.71 (51.16)	64.62 (53.48)	68.79 (56.01)
C_4	53.89 (47.21)	61.2 (51.45)	65.05 (53.74)	68.27 (55.69)
C_5	55.82 (48.32)	61.76 (51.78)	65.39 (53.94)	67.79 (55.40)
C_6	54.84 (47.76)	62.21 (52.05)	65.94 (54.27)	67.07 (54.96)
C_7	46.75 (43.12)	54.44 (47.53)	64.14 (53.19)	64.34 (53.31)
C_8	76.43 (60.93)	78.10 (62.07)	80.81 (63.99)	79.50 (63.05)
C_9	76.75 (61.15)	78.89 (62.62)	82.32 (65.11)	81.11 (64.21)
S.Em±	0.851	0.826	0.976	0.95
CD at (1%)	2.55	2.48	2.93	2.85
Interaction				
T_1: G_1C_1	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)
T_2: G_1C_2	55.40 (48.08)	56.77 (48.87)	63.79 (52.98)	66.59 (54.67)
T_3: G_1C_3	52.72 (46.54)	61.00 (51.33)	64.66 (53.50)	69.00 (56.14)
T_4: G_1C_4	54.10 (47.33)	61.14 (51.42)	65.05 (53.74)	68.34 (55.74)
T_5: G_1C_5	55.60 (48.20)	61.55 (51.66)	65.48 (54.00)	67.67 (55.33)
T_6: G_1C_6	55.02 (47.86)	62.17 (52.02)	65.91 (54.26)	67.00 (54.92)
T_7: G_1C_7	52.00 (46.13)	59.00 (50.16)	64.21 (53.23)	66.00 (54.31)
T_8: G_1C_8	76.34 (60.87)	77.89 (61.93)	80.93 (64.08)	82.00 (64.87)
T_9: G_1C_9	76.63 (61.07)	78.88 (62.62)	82.82 (65.49)	84.00 (66.40)
T_{10}: G_2C_1	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)
T_{11}: G_2C_2	40.85 (39.71)	46.27 (42.84)	63.79 (52.98)	67.00 (54.92)

T_{12}: G_2C_3	53.15 (46.79)	61.00 (51.33)	64.66 (53.50)	68.34 (55.74)
T_{13}: G_2C_4	54.29 (47.44)	61.33 (51.53)	65.05 (53.74)	68.12 (55.60)
T_{14}: G_2C_5	56.41 (48.66)	62.17 (52.02)	65.48 (54.00)	67.59 (55.28)
T_{15}: G_2C_6	55.06 (47.88)	62.30 (52.10)	65.91 (54.26)	67.00 (54.92)
T_{16}: G_2C_7	57.25 (49.15)	57.54 (49.32)	64.21 (53.23)	58.21 (49.71)
T_{17}: G_2C_8	76.63 (61.07)	78.54 (62.38)	80.93 (64.08)	74.5 (59.65)
T_{18}: G_2C_9	77.00 (61.32)	79.23 (62.86)	82.82 (65.49)	76.33 (60.86)
T_{19}: G_3C_1	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)	100.00 (89.96)
T_{20}: G_3C_2	50.85 (45.47)	56.60 (48.77)	63.79 (52.98)	69.03 (56.16)
T_{21}: G_3C_3	53.15 (46.79)	60.13 (50.82)	64.21 (53.23)	69.03 (56.16)
T_{22}: G_3C_4	54.29 (47.44)	61.14 (51.42)	65.05 (53.74)	68.34 (55.74)
T_{23}: G_3C_5	56.41 (48.66)	61.55 (51.66)	65.05 (53.74)	68.12 (55.60)
T_{24}: G_3C_6	55.06 (47.88)	62.17 (52.02)	65.91 (54.26)	67.2 (55.04)
T_{25}: G_3C_7	47.25 (43.41)	57.77 (49.45)	64.00 (53.11)	68.8 (56.02)
T_{26}: G_3C_8	76.63 (61.07)	77.87 (61.91)	80.57 (63.82)	82.00 (64.87)
T_{27}: G_3C_9	77.00 (61.32)	78.57 (62.40)	81.32 (64.37)	83.00 (65.62)
Mean	61.58 (51.67)	68.03 (55.55)	71.99 (58.02)	72.36 (58.26)
S.Em±	19.05	16.70	13.02	12.19
CD at (1%)	57.15	50.12	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes with dormancy inducing chemicals (G× C)

Significant difference of germination percentage due to interaction effect of dormancy inducing chemicals and genotypes of seed was noticed in initial and 7th day of storage with higher percentage (100%) of seed germination in G_2C_1 and lower seed percent of seed germination in G_2C_2 with 40.85 % and 46.27 % at initial and 7th day of storage.

4.2.2 Dormant seed (%)

The results on dormant seed per cent of green gram seeds as influenced seed treatment with dormancy inducing chemicals in three genotypes and their interaction effect at different days of storage are presented in Table 25.

Due to genotypes

Dormant seed percentage of seeds differed significantly between the genotypes from initial to 21 days of storage period. From the data it was observed that the genotypes differed significantly in respect of dormant seed percentage till 21 days of testing. At 0 day of testing the genotype G_2 recorded (38.91) mean highest dormant seed per cent from initial to 29.88 at 21 day followed by G_1 recorded 38.71 to 27.32 and 37.64 to 27.72 in G_3

Due to chemicals

Dormant seed percentage of seeds significantly differed between the seed treatment with dormancy inducing chemicals till 21 days of storage. Higher seed dormant percentage (54.49) was recorded in the C_2 (control) at the beginning to 39.13 at last, followed by C7 with dormant per cent from 53.25 to 35.66 per cent and lower in C_1 with zero per cent.

Interaction effect of genotypes with dormancy inducing chemicals (G× C)

Significant difference of dormant seed percentage due to interaction effect of dormancy inducing chemicals and genotypes of seed was noticed in initial and 7th day

Table 25. Effect of different concentration of MH, PB and PEG seed treatment on dormant seed (%) of green gram genotypes during storage

Treatment	Days of storage			
	Dormant seed (%)			
	0	7	14	21
G_1	38.71 (38.46)	31.29 (34.00)	27.46 (31.59)	27.32 (31.50)
G_2	38.91 (38.58)	33.06 (35.08)	28.77 (32.42)	29.88 (33.12)
G_3	37.64 (37.83)	31.58 (34.18)	27.79 (31.80)	25.72 (30.46)
S.Em±	0.166	0.160	0.173	0.246
CD at (1%)	0.50	0.48	0.52	0.74
Chemicals (C)				
C_1	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
C_2	54.49 (47.56)	43.12 (41.03)	40.35 (39.42)	39.13 (38.71)
C_3	47.33 (43.45)	39.29 (38.80)	35.38 (36.48)	31.21 (33.95)
C_4	46.11 (42.75)	38.80 (38.51)	34.95 (36.23)	31.73 (34.27)
C_5	44.18 (41.64)	38.24 (38.18)	34.61 (36.02)	32.21 (34.56)
C_6	45.16 (42.21)	37.79 (37.92)	34.06 (35.69)	32.93 (35.00)
C_7	53.25 (46.84)	45.56 (42.44)	35.86 (36.77)	35.66 (36.65)
C_8	23.57 (29.03)	21.90 (27.89)	19.19 (25.97)	20.50 (26.91)
C_9	23.25 (28.82)	21.11 (27.32)	17.68 (24.85)	18.89 (25.75)
S.Em±	0.166	0.913	0.963	4.16
CD at (1%)	0.50	2.74	2.89	12.84
Interactions (GxC)				
T_1: G_1C_1	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
T_2: G_1C_2	44.60 (41.88)	43.23 (41.09)	36.21 (36.98)	33.41 (35.30)
T_3: G_1C_3	47.28 (43.42)	39.00 (38.63)	35.34 (36.46)	31.00 (33.82)
T_4: G_1C_4	45.90 (42.63)	38.86 (38.55)	34.95 (36.26)	31.66 (34.23)
T_5: G_1C_5	44.40 (41.77)	38.45 (38.31)	34.52 (35.97)	32.33 (34.64)
T_6: G_1C_6	44.98 (42.10)	37.83 (37.94)	34.09 (35.71)	33.00 (35.05)
T_7: G_1C_7	48.00 (43.84)	41.00 (39.80)	35.79 (36.73)	34.00 (35.65)
T_8: G_1C_8	23.66 (29.09)	22.11 (28.04)	19.07 (25.88)	18.00 (25.09)
T_9: G_1C_9	23.37 (28.90)	21.12 (27.35)	17.18 (24.48)	16.00 (23.59)
T_{10}: G_2C_1	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

T_{11}: G_2C_2	59.15 (50.25)	53.73 (47.12)	36.21 (36.98)	33.00 (35.05)
T_{12}: G_2C_3	46.85 (43.18)	39.00 (38.63)	35.34 (36.46)	31.66 (34.23)
T_{13}: G_2C_4	45.71 (42.52)	38.67 (38.44)	34.95 (36.23)	31.88 (34.36)
T_{14}: G_2C_5	43.59 (41.30)	37.83 (37.94)	34.52 (35.97)	32.41 (34.69)
T_{15}: G_2C_6	44.94 (42.08)	37.70 (37.86)	34.09 (35.71)	33.00 (35.05)
T_{16}: G_2C_7	42.75 (40.81)	42.46 (40.65)	35.79 (36.73)	41.79 (40.26)
T_{17}: G_2C_8	23.37 (28.90)	21.46 (27.97)	19.07 (25.88)	25.50 (30.32)
T_{18}: G_2C_9	23.00 (28.65)	20.77 (27.10)	17.18 (24.48)	23.67 (29.10)
T_{19}: G_3C_1	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
T_{20}: G_3C_2	49.15 (44.50)	43.40 (41.19)	36.21 (36.98)	30.97 (33.80)
T_{21}: G_3C_3	46.85 (43.18)	39.87 (39.14)	35.79 (36.73)	30.97 (33.80)
T_{22}: G_3C_4	45.71 (42.52)	38.86 (38.55)	34.95 (36.23)	31.66 (34.23)
T_{23}: G_3C_5	43.59 (41.30)	38.45 (38.31)	34.95 (36.23)	31.88 (34.36)
T_{24}: G_3C_6	44.94 (42.08)	37.83 (37.94)	34.09 (35.71)	32.80 (34.93)
T_{25}: G_3C_7	52.75 (46.56)	42.23 (40.51)	36.00 (36.86)	31.20 (33.94)
T_{26}: G_3C_8	23.37 (28.90)	22.13 (28.05)	19.43 (26.14)	18.00 (25.09)
T_{27}: G_3C_9	23.00 (28.65)	21.43 (27.56)	18.68 (25.60)	17.00 (24.34)
Mean	38.42 (38.29)	31.97 (34.42)	28.01 (31.94)	27.64 (31.71)
S.Em±	11.38	6.15	13.07	13.64
CD at (1%)	34.15	18.46	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

of storage with higher percentage (59.15) of seed germination in G_2C_1 and lower seed percent of dormant seeds in G_1C_1, G_2C_1, G_3C_1 with zero percent.

4.2.3 Root length (cm)

The results on root length of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 26

With the advancement of storage period, root length was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Root length of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher root length throught the storage period and recorded 11.64 cm at the beginning to 14.84 cm till the end of storage period, followed by G_1 from 11.48 to 14.71 cm. Lower percentage of root length was noticed in G_3 where, the root length varied from 11.35 at the beginning to 14.79 after 21 days of storage period.

Due to chemicals

Root length of seeds significantly differed between the chemicals till 21 days of storage period. Higher root length (16.84 cm) was recorded in the C_1 (control) at the beginning to 16.53 cm after 21 days of storage period, followed by C_9 from 11.55 to 15.00 cm and lower in C_2 from 9.43 to 14.28 cm till 21 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of root length of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher root length 16.88 cm at the beginning of storage period

Table 26. Effect of different concentration of MH, PB and PEG on root length (cm) by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	Root length (cm)			
	0	7	14	21
G_1	11.48	12.73	14.67	14.71
G_2	11.64	12.87	14.55	14.84
G_3	11.35	12.67	14.64	14.79
S.Em±	0.070	0.083	0.106	0.130
CD at (1%)	0.21	0.25	0.32	0.39
Chemicals (C)				
C_1	16.84	16.83	16.79	16.53
C_2	9.43	12.06	13.54	14.28
C_3	10.33	12.06	14.20	14.46
C_4	10.68	12.13	14.26	14.60
C_5	11.10	12.18	14.32	14.64
C_6	11.25	12.24	14.37	14.73
C_7	10.10	11.96	13.95	14.26
C_8	11.44	12.35	14.44	14.68
C_9	11.55	12.43	14.55	15.00
S.Em±	0.18	0.20	0.213	0.226
CD at (1%)	0.54	0.60	0.64	0.68
Interactions (GxC)				
T_1: G_1C_1	16.67	16.45	15.82	15.53
T_2: G_1C_2	9.43	11.90	13.89	14.20
T_3: G_1C_3	10.32	12.08	14.20	14.43
T_4: G_1C_4	10.54	12.14	14.26	14.61
T_5: G_1C_5	11.09	12.19	14.32	14.63
T_6: G_1C_6	11.22	12.25	14.37	14.73
T_7: G_1C_7	10.21	11.96	14.16	14.30
T_8: G_1C_8	11.44	12.34	14.46	14.50
T_9: G_1C_9	11.53	12.43	14.55	15.01
T_{10}: G_2C_1	16.88	16.74	16.34	15.43
T_{11}: G_2C_2	9.85	12.57	12.85	14.48
T_{12}: G_2C_3	10.45	12.09	14.22	14.53
T_{13}: G_2C_4	11.03	12.15	14.27	14.61
T_{14}: G_2C_5	11.18	12.21	14.37	14.64
T_{15}: G_2C_6	11.33	12.25	14.37	14.77
T_{16}: G_2C_7	10.20	12.00	13.57	14.21
T_{17}: G_2C_8	11.46	12.40	14.49	14.78
T_{18}: G_2C_9	11.63	12.44	14.57	15.09
T_{19}: G_3C_1	16.34	16.74	16.43	15.97
T_{20}: G_3C_2	9.02	11.72	13.88	14.15
T_{21}: G_3C_3	10.23	12.02	14.20	14.42
T_{22}: G_3C_4	10.48	12.10	14.25	14.58
T_{23}: G_3C_5	11.04	12.15	14.28	14.63
T_{24}: G_3C_6	11.19	12.24	14.37	14.67
T_{25}: G_3C_7	9.88	11.93	14.12	14.28
T_{26}: G_3C_8	11.43	12.33	14.37	14.77
T_{27}: G_3C_9	11.48	12.42	14.55	14.88
Mean	11.49	12.76	0.294	0.310
S.Em±	3.249	2.277	2.11	3.17
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm ,

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

was recorded in G_2C_1 followed by G_1C_1 with 16.67 while, lower root length of 9.02 was observed in G_3C_2 at the beginning of storage period.

4.2.4 Shoot length (cm)

The results on shoot length of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 27.

With the advancement of storage period, shoot length was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Shoot length of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher shoot length throught the storage period and recorded 9.77 cm at the beginning to 10.75 cm till the end of storage period, followed by G_1 from 8.95 to 10.23 cm. Lower percentage of shoot length was noticed in G_3 where, the shoot length varied from 8.93 at the beginning to 10.53 after 21 days of storage period.

Due to chemicals

Shoot length of seeds significantly differed between the chemicals till 21 days of storage period. Higher shoot length (15.49 cm) was recorded in the C_1 (control) at the beginning to 11.98 cm after 21 days of storage period, followed by C_9 from 8.96 to 10.18 cm and lower in C_2 from 8.06 to 10.53 cm till 21 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of shoot length of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes

Table 27. Effect of different concentration of MH, PB and PEG on shoot length (cm) by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	Shoot length(cm)			
	0	7	14	21
G_1	8.95	9.47	9.81	10.23
G_2	9.77	10.32	10.41	10.75
G_3	8.93	9.80	10.05	10.53
S.Em±	0.070	0.077	0.079	0.082
CD at (1%)	0.23	0.29	0.30	0.31
Chemicals (C)				
C_1	15.49	13.99	12.70	11.98
C_2	8.06	9.31	10.04	10.53
C_3	8.34	8.82	9.45	10.59
C_4	8.09	9.58	10.16	10.00
C_5	8.26	9.65	9.57	10.11
C_6	8.52	9.01	9.61	10.55
C_7	8.16	9.42	10.05	10.56
C_8	9.20	9.16	9.65	10.31
C_9	8.96	9.85	9.56	10.18
S.Em±	0.153	0.166	0.173	0.18
CD at (1%)	0.46	0.50	0.52	0.54
Interactions (GxC)				
T_1: G_1C_1	13.57	13.24	12.59	12.17
T_2: G_1C_2	7.48	8.67	9.35	9.88
T_3: G_1C_3	7.90	8.82	9.46	9.96
T_4: G_1C_4	8.07	8.92	9.51	10.01
T_5: G_1C_5	8.24	9.00	9.57	10.15
T_6: G_1C_6	8.56	9.01	9.60	10.16
T_7: G_1C_7	7.78	8.76	9.39	9.89
T_8: G_1C_8	8.65	9.20	9.62	10.28
T_9: G_1C_9	8.67	9.25	9.68	10.38
T_{10}: G_2C_1	14.64	14.16	13.43	13.00
T_{11}: G_2C_2	9.00	9.97	10.55	11.11
T_{12}: G_2C_3	8.91	8.82	9.46	11.10
T_{13}: G_2C_4	8.22	10.20	11.04	10.00
T_{14}: G_2C_5	8.32	10.50	9.58	10.16
T_{15}: G_2C_6	8.56	9.01	9.61	10.46
T_{16}: G_2C_7	8.82	10.13	10.83	11.00
T_{17}: G_2C_8	9.85	9.22	9.68	10.35
T_{18}: G_2C_9	9.75	10.55	9.33	9.82
T_{19}: G_3C_1	14.16	14.01	13.85	13.43
T_{20}: G_3C_2	8.00	9.29	10.22	10.59
T_{21}: G_3C_3	8.22	8.80	9.41	10.71
T_{22}: G_3C_4	8.00	9.61	9.94	9.98
T_{23}: G_3C_5	8.22	9.46	9.56	10.01
T_{24}: G_3C_6	8.45	9.01	9.60	11.02
T_{25}: G_3C_7	7.58	9.36	9.94	9.89
T_{26}: G_3C_8	9.09	9.05	9.65	10.29
T_{27}: G_3C_9	8.45	9.74	9.67	10.34
Mean	9.23	9.86	10.09	10.50
S.Em±	3.122	2.231	1.533	1.20
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm ,

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

However, numerically higher shoot length 14.64 cm at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 13.57 while, lower root length of 9.00 was observed in G_2C_2 at the beginning of storage period.

4.2.5 Seedling vigour index

The results on seedling vigour index of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 28

With the advancement of storage period, seedling vigour index was increased drastically irrespective of the treatments except with C_1 (control) treatment combination

Due to genotype

Seedling vigour index of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher seedling vigour index throught the storage period and recorded 1307 at the beginning to 1794 till the end of storage period, followed by G_3 from 1264 to 1880. Lower percentage of seedling vigour index was noticed in G_1 where, the seedling vigour index varied from 1252 at the beginning to 1812 after 21 days of storage period.

Due to chemicals

Seedling vigour index of seeds significantly differed between the chemicals till 21 days of storage period. Higher seedling vigour index (3233) was recorded in the C_1 (control) at the beginning to 2851 after 21 days of storage period, followed by C_9 from 1574 to 2042 and lower in C_2 from 795 to 1510 till 35 days of storage.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of seedling vigour index of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and

Table 28. Effect of different concentration of MH, PB and PEG on seedling vigour index by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	Seedling vigour index			
	0	7	14	21
G_1	1252	1525	1775	1812
G_2	1307	1552	1777	1794
G_3	1264	1537	1782	1880
S.Em±	18.756	20.966	21.15	24.47
CD at (1%)	56.27	62.9	63.45	73.31
Chemical				
C_1	3233	3082	2949	2851
C_2	795	1215	1406	1510
C_3	983	1267	1528	1723
C_4	1011	1328	1588	1679
C_5	1080	1348	1562	1677
C_6	1084	1321	1581	1695
C_7	853	1163	1539	1596
C_8	1577	1679	1946	1986
C_9	1574	1757	1984	2042
S.Em±	91.806	113.3	133.6	274.45
CD at (1%)	275.42	339.95	400.87	823.35
Interaction				
T_1: G_1C_1	3024	2969	2841	2770
T_2: G_1C_2	936	1167	1482	1603
T_3: G_1C_3	960	1274	1530	1683
T_4: G_1C_4	1006	1287	1546	1683
T_5: G_1C_5	1074	1304	1564	1677
T_6: G_1C_6	1088	1321	1580	1668
T_7: G_1C_7	935	1222	1512	1597
T_8: G_1C_8	1533	1677	1949	2032
T_9: G_1C_9	1547	1710	2007	2133
T_{10}: G_2C_1	3152	3090	2977	2843
T_{11}: G_2C_2	770	1042	1493	1715
T_{12}: G_2C_3	1028	1275	1531	1752
T_{13}: G_2C_4	1045	1370	1646	1676
T_{14}: G_2C_5	1100	1411	1568	1676
T_{15}: G_2C_6	1095	1324	1581	1690
T_{16}: G_2C_7	1088	1273	1567	1467
T_{17}: G_2C_8	1632	1698	1956	1872
T_{18}: G_2C_9	1646	1821	1979	1901
T_{19}: G_3C_1	3050	3075	3028	2940
T_{20}: G_3C_2	865	1189	1537	1708
T_{21}: G_3C_3	980	1251	1516	1735
T_{22}: G_3C_4	1003	1327	1574	1678
T_{23}: G_3C_5	1086	1330	1551	1678
T_{24}: G_3C_6	1081	1321	1580	1726
T_{25}: G_3C_7	824	1229	1540	1663
T_{26}: G_3C_8	1572	1664	1935	2055
T_{27}: G_3C_9	1534	1741	1970	2093
Mean	1276	1539	748	782
S.Em±	719.667	523.093	441.93	303.52
CD at (1%)	NS	NS	NS	NS

NS: Non-significant
Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4
Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

genotypes However, numerically higher seedling vigour index 3152 at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 3024 while, lower seedling vigour index of 770 was observed in G_1C_2 at the beginning of storage period.

4.2.6 Seedling dry weight (mg)

The results on seedling dry weight of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 29

With the advancement of storage period, seedling dry weight was increased drastically irrespective of the treatments except with C_1 (control) treatment combination.

Due to genotype

Seedling dry weight of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher seedling dry weight throught the storage period and recorded 52.62 mg at the beginning to 60.41 mg till the end of storage period, followed by G_1 from 50.78 to 59.00 mg. Lower seedling dry weight was noticed in G_3 where, the seedling dry weight varied from 50.45 mg at the beginning to 58.56 mg after 21 days of storage period.

Due to chemicals

Seedling dry weight of seeds significantly differed between the chemicals till 21 days of storage period. Higher seedling dry weight (60.56) was recorded in the C_1 (control) at the beginning to 58.83 mg after 21 days of storage period, followed by C_9 from 52.48 to 59.76 mg and lower in C_2 from 45.38 to 57.86 mg till 21 days of storage.

Table 29. Effect of different concentration of MH, PB and PEG on seedling dry weight (mg) by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	seedling dry weight(mg)			
	0	7	14	21
G_1	50.78	57.52	57.55	59.00
G_2	52.62	58.49	59.78	60.41
G_3	50.45	57.05	57.12	58.56
S.Em±	0.102	0.155	0.175	0.112
CD at (1%)	0.31	0.47	0.53	0.34
Chemicals (C)				
C_1	60.56	60.06	60.22	58.83
C_2	45.38	52.43	55.88	57.86
C_3	50.22	57.16	56.67	58.32
C_4	47.30	57.44	59.43	60.16
C_5	51.20	57.71	57.16	60.42
C_6	51.75	58.19	59.91	60.89
C_7	45.77	56.35	56.20	58.05
C_8	49.40	58.76	57.63	59.63
C_9	52.48	59.10	60.23	59.76
S.Em±	0.79	0.846	0.903	0.933
CD at (1%)	2.37	2.54	2.71	2.80
Interactions (GxC)				
T_1: G_1C_1	64.16	63.70	62.68	60.32
T_2: G_1C_2	49.20	55.95	58.30	59.50
T_3: G_1C_3	50.25	57.32	59.00	60.05
T_4: G_1C_4	50.98	57.43	59.45	60.13
T_5: G_1C_5	51.42	57.70	59.65	60.48
T_6: G_1C_6	52.04	58.10	59.95	60.79
T_7: G_1C_7	49.59	56.27	58.68	59.73
T_8: G_1C_8	52.77	58.75	60.08	61.30
T_9: G_1C_9	53.13	59.19	60.22	61.43
T_{10}: G_2C_1	61.26	61.00	59.20	58.20
T_{11}: G_2C_2	46.41	50.70	54.95	57.36
T_{12}: G_2C_3	47.30	57.35	55.71	57.82
T_{13}: G_2C_4	48.15	57.51	59.49	60.23
T_{14}: G_2C_5	51.50	57.82	56.20	60.48
T_{15}: G_2C_6	52.05	58.56	60.01	61.09
T_{16}: G_2C_7	46.91	56.68	55.35	57.66
T_{17}: G_2C_8	53.05	58.82	56.78	58.95
T_{18}: G_2C_9	50.42	59.27	60.24	59.21
T_{19}: G_3C_1	60.56	59.49	58.77	57.97
T_{20}: G_3C_2	45.38	50.64	54.40	56.71
T_{21}: G_3C_3	50.22	56.82	55.30	57.09
T_{22}: G_3C_4	47.30	57.38	59.36	60.11
T_{23}: G_3C_5	51.20	57.60	55.62	60.30
T_{24}: G_3C_6	51.75	57.90	59.77	60.78
T_{25}: G_3C_7	45.77	56.11	54.57	56.77
T_{26}: G_3C_8	52.48	58.70	56.04	58.65
T_{27}: G_3C_9	49.40	58.84	60.22	58.65
Mean	50.45	57.69	58.15	59.326
S.Em±	6.089	5.166	3.242	2.285
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of seedling dry weight of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher seedling dry weight 64.16 mg at the beginning of storage period was recorded in G_1C_1 followed by G_2C_1 with 61.26 mg while, lower seedling dry weight of 46.41 mg was observed in G_2C_2 at the beginning of storage period.

4.2.7 Insect infestation (%)

The results on insect infestation of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 30.

With the advancement of storage period, insect infestation was increased drastically irrespective of the treatments.

Due to genotype

Insect infestation of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_3 was gave higher per cent of insect infestation throught the storage period and recorded 1.28 per cent at the beginning to 5.71 per cent till the end of storage period, followed by G_1 from 1.25 to 3.20. Lower insect infestation was noticed in G_2 where, the insect infestation varied from 1.18 at the beginning to 2.47 after 21 days of storage period.

Due to chemicals

Insect infestation of seeds significantly differed between the. Higher insect infestation (2.08) was recorded in the C_1 (control) at the beginning to 3.40 after 21 days of storage period, followed by C_9 from 2.01 to 4.19 per cent and lower in C_2 from 0.60 to 1.48 mg till 21 days of storage.

Table 30. Effect of different concentration of MH, PB and PEG on insect infestation (%) by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	Insect infestation (%)			
	0	7	14	21
G_1	1.25	1.18	2.06	3.20
G_2	1.18	1.14	1.53	2.47
G_3	1.28	1.42	1.76	5.71
S.Em±	0.032	0.039	0.042	0.050
CD at (1%)	0.12	0.14	0.12	0.13
Chemicals (C)				
C_1	2.08	2.17	2.69	3.40
C_2	0.60	0.57	0.76	1.48
C_3	0.70	0.75	0.81	2.41
C_4	1.10	1.13	1.82	2.83
C_5	1.30	1.22	2.05	2.37
C_6	1.33	1.28	1.86	3.38
C_7	0.61	0.68	0.83	1.52
C_8	1.40	1.49	2.30	3.56
C_9	2.01	1.95	2.94	4.19
S.Em±	0.07	0.08	0.09	0.11
CD at (1%)	0.21	0.24	0.27	0.33
Interactions (GxC)				
T_1: G_1C_1	2.08	2.09	3.08	4.41
T_2: G_1C_2	0.59	0.43	1.26	2.16
T_3: G_1C_3	0.67	0.59	1.45	2.41
T_4: G_1C_4	1.27	1.11	2.00	2.94
T_5: G_1C_5	1.30	1.25	2.05	3.25
T_6: G_1C_6	1.33	1.29	2.08	3.41
T_7: G_1C_7	0.61	0.53	1.36	2.37
T_8: G_1C_8	1.42	1.42	2.25	3.57
T_9: G_1C_9	2.00	1.95	2.99	4.25
T_{10}: G_2C_1	2.08	2.41	3.02	3.10
T_{11}: G_2C_2	0.51	0.86	0.74	1.24
T_{12}: G_2C_3	0.75	0.98	0.55	2.41
T_{13}: G_2C_4	1.28	1.50	2.01	3.12
T_{14}: G_2C_5	1.32	1.26	2.08	2.06
T_{15}: G_2C_6	1.33	1.31	1.45	3.47
T_{16}: G_2C_7	0.61	0.87	0.70	1.14
T_{17}: G_2C_8	1.45	1.68	2.41	3.58
T_{18}: G_2C_9	2.07	1.96	2.91	4.25
T_{19}: G_3C_1	2.38	2.00	1.97	2.70
T_{20}: G_3C_2	0.60	0.43	0.27	1.03
T_{21}: G_3C_3	0.67	0.67	0.43	2.41
T_{22}: G_3C_4	0.75	0.78	1.45	2.41
T_{23}: G_3C_5	1.29	1.17	2.02	1.80
T_{24}: G_3C_6	1.31	1.25	2.05	3.25
T_{25}: G_3C_7	0.61	0.63	0.44	1.06
T_{26}: G_3C_8	1.33	1.36	2.25	3.52
T_{27}: G_3C_9	1.97	1.94	2.91	4.08
Mean	1.24	1.25	1.79	2.79
S.Em±	0.597	0.763	1.126	1.151
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of insect infestation of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher insect infestation 2.38 per cent at the beginning of storage period was recorded in G_3C_1 followed by G_1C_1 with 2.08 per cent while, lower insect infestation of 0.51 per cent was observed in G_2C_2 at the beginning of storage period.

4.2.8 Disease infection (%)

The results on disease infection of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 31.

With the advancement of storage period, disease infection was increased drastically irrespective of the treatments.

Due to genotype

Disease infection of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_3 was gave higher per cent of disease infection throught the storage period and recorded 1.72 per cent at the beginning to 3.76 per cent till the end of storage period, followed by G_1 from 1.69 to 3.62. Lower disease infection was noticed in G_2 where, the disease infection varied from 1.64 at the beginning to 3.55 after 21 days of storage period.

Due to chemicals

Disease infection of seeds significantly differed between the chemicals till 21 days of storage period. Higher disease infection (2.57) was recorded in the C_1 (control) at the beginning to 4.63 after 21 days of storage period, followed by C_9 from 2.54 to 4.44 per cent and lower in C_2 from 0.11 to 2.87 till 21 days of storage.

Table 31. Effect of different concentration of MH, PB and PEG on disease infection (%) by seed treatment of green gram genotypes during storage

Treatment	Days of storage			
	Disease infection (%)			
	0	7	14	21
G_1	1.69	2.32	2.83	3.62
G_2	1.64	2.17	2.83	3.55
G_3	1.72	2.39	2.83	3.76
S.Em±	0.026	0.018	0.022	0.049
CD at (1%)	0.10	0.07	0.08	0.15
Chemicals (C)				
C_1	2.57	3.08	3.72	4.63
C_2	0.11	1.60	2.12	2.87
C_3	1.13	1.89	2.43	2.95
C_4	1.77	2.07	2.63	3.58
C_5	1.79	2.30	2.88	3.56
C_6	1.89	2.33	2.95	3.66
C_7	1.01	1.61	2.20	2.96
C_8	2.34	2.74	3.40	4.14
C_9	2.54	3.00	3.61	4.44
S.Em±	0.056	0.04	0.05	0.06
CD at (1%)	0.17	0.12	0.15	0.18
Interactions (GxC)				
T_1: G_1C_1	2.57	3.08	3.75	5.58
T_2: G_1C_2	0.00	1.60	2.10	2.78
T_3: G_1C_3	1.08	1.75	2.25	2.95
T_4: G_1C_4	1.77	2.27	2.27	3.47
T_5: G_1C_5	1.79	2.30	2.80	3.56
T_6: G_1C_6	1.92	2.33	2.95	3.58
T_7: G_1C_7	1.01	1.61	2.20	2.87
T_8: G_1C_8	2.52	2.92	3.58	4.25
T_9: G_1C_9	2.55	3.00	3.62	4.50
T_{10}: G_2C_1	2.56	3.08	4.75	4.95
T_{11}: G_2C_2	0.00	1.59	2.09	2.99
T_{12}: G_2C_3	1.25	2.25	2.78	2.96
T_{13}: G_2C_4	1.79	2.28	2.83	3.74
T_{14}: G_2C_5	1.83	2.32	2.92	3.58
T_{15}: G_2C_6	1.92	2.33	2.97	3.81
T_{16}: G_2C_7	1.03	1.61	2.22	3.14
T_{17}: G_2C_8	2.52	2.97	3.61	4.42
T_{18}: G_2C_9	2.57	3.07	3.63	4.42
T_{19}: G_3C_1	2.58	3.08	3.67	4.55
T_{20}: G_3C_2	0.33	1.61	2.17	2.83
T_{21}: G_3C_3	1.05	1.67	2.25	2.94
T_{22}: G_3C_4	1.75	1.67	2.78	3.53
T_{23}: G_3C_5	1.75	2.29	2.91	3.53
T_{24}: G_3C_6	1.83	2.31	2.92	3.58
T_{25}: G_3C_7	1.00	1.61	2.17	2.86
T_{26}: G_3C_8	1.98	2.33	3.00	3.75
T_{27}: G_3C_9	2.52	2.95	3.58	4.42
Mean	1.68	2.29	2.88	3.64
S.Em±	0.077	0.054	0.067	0.082
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm , C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of disease infection of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher disease infection 2.58 per cent at the beginning of storage period was recorded in G_3C_1 followed by G_1C_1 with 2.57 per cent while, lower disease infection of zero per cent was observed in G_2C_2 and G_1C_2at the beginning of storage period.

4.2.9 Rate of germination

The results on rate of germination of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 32

With the advancement of storage period, rate of germination was increased drastically irrespective of the treatments except with C_1 (control) treatment combination.

Due to genotype

Rate of germination of seeds differed significantly between the genotypes in all days of storage period.

Among all the three genotypes, G_2 was registered higher rate of germination throught the storage period and recorded 17.99 at the beginning to 19.98 till the end of storage period, followed by G_1 from 17.17 to 19.62. Lower percentage of rate of germination was noticed in G_3 where, varied from 17.14 at the beginning to 19.62 after 21 days of storage period.

Due to chemicals

Rate of germination of seeds significantly differed between the chemicals till 21 days of storage period. Higher rate of germination (23.51) was recorded in the C_1

Table 32. Effect of different concentration of MH, PB, PEG on rate of germination by seed treatment on of green gram genotypes during storage

Treatment	Days of storage			
	Rate of germination			
	0	7	14	21
G_1	17.17	18.53	19.14	19.62
G_2	17.99	18.99	19.58	19.98
G_3	17.14	18.42	19.07	19.62
S.Em±	0.078	0.141	0.102	0.070
CD at (1%)	0.24	0.43	0.31	0.21
Chemicals (C)				
C_1	23.51	23.06	21.87	20.19
C_2	15.93	17.81	18.63	19.14
C_3	16.29	17.75	19.29	19.87
C_4	16.53	18.29	18.73	19.55
C_5	16.81	17.97	18.86	19.64
C_6	16.89	18.09	18.94	19.74
C_7	16.27	18.06	18.93	19.80
C_8	17.02	18.59	19.03	19.86
C_9	17.66	18.23	19.11	19.97
S.Em±	0.226	0.306	0.316	0.326
CD at (1%)	0.85	0.92	0.95	0.98
Interactions (GxC)				
T_1: G_1C_1	23.08	22.63	21.43	20.03
T_2: G_1C_2	14.51	17.52	18.35	19.34
T_3: G_1C_3	16.35	17.78	18.69	19.45
T_4: G_1C_4	16.58	17.89	18.70	19.55
T_5: G_1C_5	16.81	17.96	18.85	19.63
T_6: G_1C_6	16.89	18.10	18.95	19.74
T_7: G_1C_7	15.85	17.61	18.56	19.35
T_8: G_1C_8	17.02	18.13	19.04	19.87
T_9: G_1C_9	17.25	18.24	19.10	19.97
T_{10}: G_2C_1	24.04	23.70	22.64	20.07
T_{11}: G_2C_2	18.79	18.61	19.53	20.30
T_{12}: G_2C_3	16.29	17.78	19.64	20.30
T_{13}: G_2C_4	16.66	18.86	18.82	19.60
T_{14}: G_2C_5	16.83	18.04	18.89	19.71
T_{15}: G_2C_6	16.94	18.11	18.95	19.77
T_{16}: G_2C_7	17.01	18.62	19.53	20.24
T_{17}: G_2C_8	17.11	18.97	19.04	19.89
T_{18}: G_2C_9	18.22	18.24	19.16	20.00
T_{19}: G_3C_1	23.42	22.84	21.53	20.47
T_{20}: G_3C_2	14.50	17.30	18.00	17.79
T_{21}: G_3C_3	16.23	17.70	19.55	19.87
T_{22}: G_3C_4	16.35	18.13	18.69	19.52
T_{23}: G_3C_5	16.80	17.92	18.85	19.60
T_{24}: G_3C_6	16.85	18.06	18.92	19.72
T_{25}: G_3C_7	15.94	17.94	18.70	19.80
T_{26}: G_3C_8	16.95	18.68	19.01	19.84
T_{27}: G_3C_9	17.52	18.23	19.07	19.96
Mean	17.43	18.65	19.26	19.75
S.Em±	3.392	2.421	1.436	0.836
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

(control) at the beginning to 20.19 after 21 days of storage period, followed by C_9 from 17.66 to 19.97 and lower in C_2 from 15.93 to 19.14 till 21 days of storage.

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of rate of germination of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes However, numerically higher rate of germination 24.04 at the beginning of storage period was recorded in G_2C_1 followed by G_1C_1 with 23.08 while, rate of germination of 14.50 was observed in G_3C_2 at the beginning of storage period.

4.2.10 Moisture content (%)

The results on moisture content of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 33.

With the advancement of storage period, moisture content was decreased drastically irrespective of the treatments.

Due to genotype

Moisture content of seeds did not showed significant difference between the genotypes in all the storage period.

However G_2 have given moisture content in the initial day and recorded 12.47 per cent at the beginning, followed by G_1 12.32 per cent. Lower moisture content (12.30) was noticed in G_3 at the beginning of storage period.

Due to chemicals

There was non significant difference with moisture content throught the storage period. Higher moisture content 12.90 per cent was recorded in the C_1 (control) at the beginning, followed by C_9 from 12.64 per cent and lower in C_2 (12.14) at initial period.

Table 33. Effect of different concentration of MH, PB, PEG on moisture content (%) by seed treatment on of green gram genotypes during storage

Treatment	Days of storage			
	Moisture content(%)			
	0	7	14	21
G_1	12.32	11.98	11.79	11.25
G_2	12.47	12	11.80	11.27
G_3	12.30	11.98	11.76	11.24
S.Em±	0.076	0.096	0.093	0.089
CD at (1%)	NS	NS	NS	NS
Chemicals (C)				
C_1	12.90	12.19	11.97	11.52
C_2	12.14	11.82	11.56	11.00
C_3	12.24	11.90	11.74	11.14
C_4	12.32	11.93	11.77	11.19
C_5	12.29	11.98	11.78	11.22
C_6	12.34	12.05	11.81	11.27
C_7	12.22	11.86	11.66	11.04
C_8	12.47	12.08	11.85	11.42
C_9	12.64	12.10	11.92	11.48
S.Em±	0.286	0.166	0.161	0.154
CD at (1%)	NS	NS	NS	NS
Interactions (GxC)				
T_1: G_1C_1	12.95	12.18	11.96	11.52
T_2: G_1C_2	11.97	11.80	11.56	11.00
T_3: G_1C_3	12.07	11.89	11.73	11.14
T_4: G_1C_4	12.16	11.92	11.77	11.19
T_5: G_1C_5	12.28	11.97	11.79	11.21
T_6: G_1C_6	12.33	12.05	11.82	11.26
T_7: G_1C_7	12.05	11.85	11.70	11.04
T_8: G_1C_8	12.43	12.08	11.85	11.43
T_9: G_1C_9	12.64	12.09	11.94	11.48
T_{10}: G_2C_1	13.05	12.20	12.00	11.53
T_{11}: G_2C_2	12.45	11.84	11.57	11.01
T_{12}: G_2C_3	12.55	11.91	11.76	11.16
T_{13}: G_2C_4	12.61	11.94	11.78	11.20
T_{14}: G_2C_5	12.30	12.01	11.78	11.25
T_{15}: G_2C_6	12.35	12.06	11.81	11.29
T_{16}: G_2C_7	12.51	11.88	11.71	11.07
T_{17}: G_2C_8	12.56	12.08	11.87	11.44
T_{18}: G_2C_9	12.70	12.10	11.94	11.51
T_{19}: G_3C_1	12.70	12.18	11.95	11.51
T_{20}: G_3C_2	12.00	11.80	11.55	11.00
T_{21}: G_3C_3	12.11	11.89	11.73	11.13
T_{22}: G_3C_4	12.20	11.91	11.76	11.17
T_{23}: G_3C_5	12.27	11.96	11.78	11.20
T_{24}: G_3C_6	12.32	12.02	11.80	11.26
T_{25}: G_3C_7	12.09	11.85	11.57	11.02
T_{26}: G_3C_8	12.43	12.07	11.82	11.40
T_{27}: G_3C_9	12.56	12.09	11.88	11.46
Mean	12.40	11.99	11.78	11.26
S.Em±	0.300	0.288	0.279	0.267
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of moisture of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes.

4.2.11 Protein content (%)

The results on protein content of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 34

With the advancement of storage period, protein content was decreased drastically irrespective of the treatments.

Due to genotype

Although G_2 recorded numerically high protein content (24.43%) but there was no significant difference among the genotypes.

Due to chemicals

There was non significant difference with protein content between the throught the storage period. Higher protein content (24.31%) was recorded in the C_1 (control) at the beginning, followed by C_9 from 24.27 per cent and lower in C_2 (24.17%) at initial period.

Interaction effect of genotypes and chemicals (G × C)

Non significant difference of protein content of seed was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes however maximum was in G_1C_1 (24.55%) and minimum in G_2C_2 (24.07%).

4.2.12 EC (dS/m)

The results on EC (dS/m) of green gram seeds as influenced by seed treatment of dormancy inducing chemicals, different genotypes and their interaction effect at different days of storage are presented in Table 35

Table 34. Effect of different concentration of MH, PB, PEG on protein (%) by seed treatment on of green gram genotypes during storage

Treatment	Days of storage			
	Protein (%)			
	0	7	14	21
G_1	24.19	23.99	23.67	23.41
G_2	24.43	24.04	23.72	23.47
G_3	24.10	23.84	23.61	23.37
S.Em±	0.179	0.177	0.175	1.173
CD at (1%)	NS	NS	NS	NS
Chemicals (C)				
C_1	24.31	24.02	23.69	23.45
C_2	24.17	23.91	23.64	23.39
C_3	24.19	23.92	23.64	23.40
C_4	24.25	23.94	23.68	23.42
C_5	24.23	23.93	23.67	23.41
C_6	24.22	23.93	23.67	23.41
C_7	24.18	23.91	23.64	23.39
C_8	24.28	24.01	23.68	23.45
C_9	24.27	24.00	23.68	23.42
S.Em±	0.310	0.307	0.303	0.300
CD at (1%)	NS	NS	NS	NS
Interactions (GxC)				
T_1: G_1C_1	24.55	24.07	23.74	23.53
T_2: G_1C_2	24.07	23.76	23.57	23.37
T_3: G_1C_3	24.48	24.05	23.74	23.48
T_4: G_1C_4	24.46	24.05	23.73	23.48
T_5: G_1C_5	24.43	24.05	23.72	23.45
T_6: G_1C_6	24.41	24.02	23.72	23.45
T_7: G_1C_7	24.38	24.02	23.71	23.44
T_8: G_1C_8	24.33	24.02	23.71	23.44
T_9: G_1C_9	24.31	24.00	23.71	23.43
T_{10}: G_2C_1	24.26	24.00	23.69	23.43
T_{11}: G_2C_2	24.07	23.75	23.57	23.35
T_{12}: G_2C_3	24.22	23.98	23.68	23.42
T_{13}: G_2C_4	24.19	23.98	23.68	23.42
T_{14}: G_2C_5	24.17	23.97	23.68	23.40
T_{15}: G_2C_6	24.16	24.02	23.67	23.40
T_{16}: G_2C_7	24.15	24.00	23.66	23.40
T_{17}: G_2C_8	24.15	24.00	23.66	23.40
T_{18}: G_2C_9	24.15	23.99	23.65	23.40
T_{19}: G_3C_1	24.13	23.98	23.63	23.39
T_{20}: G_3C_2	24.12	23.98	23.63	23.39
T_{21}: G_3C_3	24.11	23.97	23.63	23.38
T_{22}: G_3C_4	24.10	23.79	23.62	23.38
T_{23}: G_3C_5	24.10	23.78	23.62	23.37
T_{24}: G_3C_6	24.10	23.77	23.62	23.37
T_{25}: G_3C_7	24.09	23.76	23.59	23.37
T_{26}: G_3C_8	24.50	24.06	23.74	23.53
T_{27}: G_3C_9	24.24	23.99	23.69	23.42
Mean	24.24	23.95	23.67	23.42
S.Em±	0.538	0.532	0.525	0.520
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

Table 35. Effect of different concentration of MH, PB, PEG on EC (dS/m) by seed treatment on of green gram genotypes during storage

Treatment	Days of storage			
	EC (dS/m)			
	0	7	14	21
G_1	0.73	0.70	0.66	0.62
G_2	0.74	0.72	0.67	0.63
G_3	0.71	0.68	0.64	0.60
S.Em±	0.007	0.006	0.005	0.005
CD at (1%)	0.021	0.02	0.02	0.02
Chemicals (C)				
C_1	0.69	0.65	0.60	0.56
C_2	0.76	0.72	0.70	0.66
C_3	0.75	0.72	0.67	0.63
C_4	0.72	0.69	0.65	0.60
C_5	0.72	0.72	0.68	0.64
C_6	0.76	0.73	0.68	0.64
C_7	0.75	0.73	0.68	0.64
C_8	0.72	0.69	0.64	0.60
C_9	0.70	0.67	0.62	0.58
S.Em±	0.022	0.025	0.032	0.022
CD at (1%)	0.066	0.075	0.097	0.068
Interactions (GxC)				
T_1: G_1C_1	0.67	0.64	0.59	0.55
T_2: G_1C_2	0.78	0.75	0.70	0.66
T_3: G_1C_3	0.75	0.72	0.67	0.63
T_4: G_1C_4	0.72	0.69	0.64	0.60
T_5: G_1C_5	0.71	0.68	0.64	0.60
T_6: G_1C_6	0.76	0.73	0.68	0.64
T_7: G_1C_7	0.76	0.73	0.68	0.64
T_8: G_1C_8	0.75	0.72	0.67	0.63
T_9: G_1C_9	0.72	0.69	0.64	0.60
T_{10}: G_2C_1	0.73	0.67	0.62	0.58
T_{11}: G_2C_2	0.77	0.73	0.71	0.67
T_{12}: G_2C_3	0.75	0.72	0.68	0.64
T_{13}: G_2C_4	0.73	0.70	0.66	0.61
T_{14}: G_2C_5	0.74	0.75	0.70	0.66
T_{15}: G_2C_6	0.76	0.73	0.68	0.64
T_{16}: G_2C_7	0.76	0.74	0.69	0.65
T_{17}: G_2C_8	0.74	0.71	0.66	0.62
T_{18}: G_2C_9	0.72	0.69	0.65	0.61
T_{19}: G_3C_1	0.67	0.64	0.58	0.54
T_{20}: G_3C_2	0.74	0.67	0.68	0.64
T_{21}: G_3C_3	0.75	0.72	0.67	0.63
T_{22}: G_3C_4	0.72	0.69	0.64	0.60
T_{23}: G_3C_5	0.70	0.74	0.69	0.65
T_{24}: G_3C_6	0.75	0.72	0.67	0.63
T_{25}: G_3C_7	0.72	0.72	0.67	0.63
T_{26}: G_3C_8	0.67	0.64	0.59	0.55
T_{27}: G_3C_9	0.66	0.63	0.58	0.54
Mean	0.73	0.70	0.66	0.62
S.Em±	0.016	0.016	0.016	0.016
CD at (1%)	NS	NS	NS	NS

NS: Non-significant

Genotypes (G): Three G_1 – DGG-1, G_2 – DGGV-2, G_3 – Selection 4

Chemicals(C): Nine C_1 – Control, C_2 –MH 1000ppm, C_3 –MH 2000ppm, C_4 – MH 3000ppm, C_5 -PB 100ppm

C_6 -PB 200ppm, C_7 – PB 300ppm , C_8 -PEG-6000 18%,, C_9 -PEG-6000 26%

With the advancement of storage period, EC was decreased drastically irrespective of the treatments.

Due to genotype

EC of seeds showed significant difference between the genotypes in all the storage period.

Among all the three genotypes, G_2 have given high EC in the initial day and recorded 0.74 dS/m at the beginning, followed by G_1 from 0.73 dS/m. Lower EC (0.71 dS/m) was noticed in G_3 at the beginning of storage period.

Due to chemicals

There was significant difference between the chemicals. Higher EC 0.76 dS/m was recorded in the C_2 and C_6 at the beginning, followed by (0.75 dS/m) in C_7 and C_3 and lower in C_1 (0.69 dS/m) at initial period.

Interaction effect of genotypes and chemicals ($G \times C$)

Non significant difference of EC was noticed in all the days of storage due to interaction effect of dormancy inducing chemicals and genotypes.

5. DISCUSSION

Green gram (*Vigna radiata* (L.) Wilczek) is an important pulse crop grown popularly in India due to its easy digestibility and nutritional quality. In recent years, its average productivity (343 kg ha^{-1}) has remained static due to several constraints like non-availability of quality seeds of improved varieties, inadequate post-harvest handling and pre harvest losses *etc.*

Periods of prolonged rainfall and high humidity after the seed has ripened to harvested can contribute to pre harvest losses. The pre-harvest sprouting (in-situ germination) of the green gram cause considerable losses. Dormancy and germination are the two traits that are controlled in a highly complex manner involving one or a combination of morphology, physiology and physical structures (Baskin and Baskin, 2001; Finch-Savage and Leubner-Metzger, 2006). Dormancy can be beneficial when it prevents mature seeds from sprouting before harvest. The search for non-conventional methods of inducing dormancy in greengram to save the seed produce and to retain the seed quality against the field sprouting are of greater importance. Keeping all this in view an attempt has been made to study the feasibility of inducing seed dormancy with various concentrations of Maleic Hydrazide, Paclobutarazol and PEG-6000 in three greengram genotypes.

Field and lab experiments were conducted to study the induction of dormancy in green gram varieties viz., DDG-1, DGGV-2 and Selection 4, by different chemicals like MH with 1000 ppm, 2000 ppm and 3000 ppm, PB 100, 200 and 300 ppm and PEG-6000 18 and 26% sprayed at flowering and pod initiation stage along with control.

5.1 Experiment – I: Effect of foliar spray of dormancy inducing chemicals, genotypes and their interaction on growth, yield parameters and seed quality of green gram

In the present study foliar spray with dormancy inducing chemicals like Control, MH, PB, PEG-6000. The spray was done at two different stage like flowering and pod initiation. The plants were evaluated for field and lab performance.

The foliar application of chemicals significantly influenced the morphological characters viz., plant height, number of branches, number of pods, pod length, number of seeds per pod seed setting per cent, pod yield, seed yield and 1000 seed weight..

5.1.1 Growth parameters

Basically, plant height is a genetically controlled character, but several studies have indicated that the plant height can be increased or decreased by the growth retardant (dormancy inducing) chemicals.

In the present investigation, significant differences were noticed in the plant height at 60days after sowing (DAS) and at harvest stage due to MH at 1000@ ppm and PB @300 ppm over control, and among three genotypes Selection 4 have recorded more plant height (51.76 and 54.01 cm) followed by DGG-1 (51.35 and 53.68 cm) and less in DGGV-2 (50.98 and 54.01 cm). It was interesting to note that among MH and PB foliar application of MH recorded lesser plant height as compared to other treatments followed by PB. Among the treatments spray with MH @1000 ppm recorded significantly less plant height at 60 DAS and at harvest stage. The results showed that there was decreased in plant height with MH @1000 ppm (47.24 and 50.19 cm), PB 300 ppm (49.43 and 51.94 cm) over PEG 26% (53.10 and 55.48 cm) (Table 3) at 60 DAS and harvest stages respectively.

The inhibitory effect on plant height by MH might be due to the inhibition of cell division and reduction in cell growth and expansion. Plant growth retardants

inhibit the conversion of geranyl pyrophosphate to copalyl pyrophosphate of gibberellins biosynthesis which is responsible for shoot elongation and thus maleic hydrazide reduces the plant height. The results are comparable with other research findings [Singh (2004) in marigold, Mansuroglu et al.(2009) in *Consolida orientalis*, Caprita and Caprita (2005) in Chrysanthemum.] where they have reported that plant growth retardants inhibit gibberellins biosynthesis, stem and shoot elongation without irreversible blocking of metabolic and developmental processes in plant. However there was no significant difference was found between interaction effect of genotypes and chemicals.

Next to MH @1000ppm, PB @300 ppm gave less plant height than other treatments and control which is supported by the other research findings (Mohsen Kazemi, 2013 in cucumber) where he have reported application of PB alone significantly influenced plant height, higher concentration of PB reduced plant height(75.21cm) compared to control (147.54cm). Paclobutrazol, a powerful growth retardant, has been observed to reduce vegetative growth. This was in agreement with Nishizawa, 1993 who reported a significant decrease in vegetative of strawberry after paclobutrazol treatment. Vegetative growth components were reduced after annually application of paclobutrazol in apples (Khurshid *et al*., 1997). The growth reduction occurs because paclobutrazol inhibits the gibberellin biosynthesis, which is a hormone responsible for cell expansion (Rademacher *et al*., 2012). The results were also suppoted by the study conducted by Patil, 1995 in golden rod that plants treated with growth retardants (Maleic hydrazide and paclobutrazol) exhibited reduced plant height .These growth retardants are known to reduce auxin influence , thus reduce cell division and cell elongation.

Significant differences in number of branches per plant were noticed among the treatments from 60 DAS to harvest. Among the genotypes DGGV2 has given more number of branches compared to the rest of genotypes. These results showed

that there was increased in branches with foliar spray of MH@1000 ppm (5.44 and 5.94) followed by PB @300 ppm (5.14 and 5.69) over PEG 26% (4.18 and 5.12) (Table 4)

The inhibition of apical growth may have been due to the effect of maleic hydrazide on cell division (Greulach and Atchinson, 1953) and plant polar auxin transport (Arora *et al.,* 1982 in summer squash). Similar findings were reported by Murthy *et al*. (2007) in gherkin. Miller *et al*. (1969) attributed the increased in number of branches in eggplant and pepper to forced lateral bud development and injury to the terminal bud by the use of growth regulators, which endorsed the present findings. The mechanism of increasing the number of branches due to application of maleic hydrazide at 1000 ppm that lead to slowing down of cell division and reduction in cell expansion as well as reduced plant height but partially increased the number of branches. But there was no significant difference was found between interaction effect of genotypes and chemicals.

Similar supporting findings to the effect of foliar application of paclobutrazol results were reported by Pushpendra Kumar, *et al.,* 2015 in pigeonpea . Plant height and internodal length was reduced due to foliar application of paclobutrazol 40 SC @ 90ml/ha. The number of branches increased up to harvest and all the treatments significantly increased the number of branches per plant between 90 DAS and at harvest. The number of productive branches was significantly higher in treatment paclobutrazol 40 SC @ 90ml/ha. Among the most important yield attributing traits viz; number of pods per plant, number of seeds per pod and number of filled pods per plant, pod length, pod width, pod weight, 100 seed weight, biological yield and seed yield were observed to be the major yield attributing character as influenced by the foliar application of plant growth regulators especially treatment paclobutrazol 40 SC @ 90ml/ha as compared to control.

5.1.2 Yield Parameters

In the present investigation, significant differences were noticed in the yield parameters due to genotypes and chemical spray when compared to control. Among three genotypes DGGV-2 gave significantly higher yield and yield parameters and among the chemicals MH 1000 ppm gave higher yield with no adverse effect on yield parameters of green gram due to spraying of MH at 1000 ppm as compared to different chemicals and concentration.

Yield Parameters were significantly influenced by the chemicals. Plot sprayed with MH @1000 ppm(C_2) recorded significantly higher number of pods per plant (11.69, 16.28 and 16.51), pod length (9.32, 13.30 and 13.46cm), number of seeds per pod(10.11, 14.76 and 14.77) at 60, 75 DAS and harvest stages respectively, seed setting percent(88.83, 98.88 and 100.00%) pod yield per plant (3.45g), pod yield per plot (0.34 kg), pod yield per hectare (922.38 kg), seed yield per plant (2.63 g), seed yield per plot (0.28 kg), seed yield per hectare(706.78 kg), and 1000 seed weight (41.52 g) followed by PB @300 ppm (C_7) with number of pods (11.06, 15.84, 15.92), pod length(9.29, 13.14 and13.26 cm) number of seeds per pod(10.12, 14.72 and 14.74) at 60, 75 DAS and harvest stages respectively and at harvest stage pod yield per plant (3.23g), pod yield per plot (0.32 kg), pod yield per hectare (907.04 kg), seed yield per plant (2.11 g), seed yield per plot (0.23 kg), seed yield per hectare(624.09 kg), and 1000 seed weight (38.60 g). While PEG 26% (C_9) had les number of pods (8.54, 12.57 and 13.26), pod length(8.39, 10.29, 10.33cm) number of seeds per pod(9.63, 10.38 and 10.64) at 60, 75 DAS and harvest stages respectively and at harvest stage pod yield per plant (2.73g), pod yield per plot (0.278 kg), pod yield per hectare (773.50 kg), seed yield per plant (2.02g), seed yield per plot (0.22 kg), seed yield per hectare(612.70 kg), and 1000 seed weight (37.30g) at harvest stage recorded lower values.

Pod and seed yield and its contributing traits such number of pods per plant, pod length, number of seeds per pod, seed setting per cent, 1000 seed weight, were influenced by the application of lower concentrations of maleic hydrazide. Different times of application of growth retardants differed significantly to produce pod per plant. The highest pods per plant, pod length were seen with MH 1000 ppm followed by PB 300 ppm and least was seen by PEG 26 %.

A probable reason for positive yield response due to MH spray was suggested by Ries (1985), which endorsed the present results, was that the application of growth retardants like maleic hydrazide increased the endogenous ethylene level which triggered metabolic processes and affected the C: N ratio in plants, in turn stimulating flowering, pod and seed set ratio and there by seed yield. These results are in conformation with the findings of Bhat *et al*. (2004) who have reported maximum fruit yield in watermelon with an application of maleic hydrazide at 100 ppm.MH produced high number of seeds per pod compared to other treatments

In the present experiment, the increase the seed yield might be attributed to the superior values of morphological and yield contributing characters in plants. The increase in total number of seeds and 1000 seed weight with growth retardant treatments might be due to better translocation of photosynthates by shortening the plant size. The efficiency of translocation depends on the distance between the source and sink and it is inversely related i.e., shorter the distance, better will be the translocation and vice versa (Pando and Srivastava, 1987 in sunflower; Patil and Dhomne, 1997 in sunflower).However there was no significant difference was found between interaction effect of genotypes and chemicals.

The decrease in growth and yield parameters in green gram plants by PEG -6000 over control was due to the reason that there was induction of stress. But it gave the more plant height (53.56 and 55.71 cm) when compared to control (52.53 and 54.58 cm) Current investigations confirm the earlier reports that pointed plant height

as a drought tolerance index and declared that tall soybean cultivar had more dry weight, and drought stress adversely affect all growth parameters (Daneshian and Jonobi, 2001). The yield parameters also have reduced under PEG. Current results are in concurrence with the earlier reports, which stated that seed yield drastically reduced when drought occurs during flowering time (Hsiao, 1982 in rice).The yield reduction under stress condition may be due to the decline in number of seeds per pod caused by flower abscission during flowering stage (Daneshian and Zare, 2005 in soybean)

5.1.3 Seed Quality Parameters

After the harvest of the crop, the resultant seeds were analyzed for various seed quality parameters. All the treatments differed significantly on all seed quality parameters germination (%), dormant (%), rate of germination, root length (cm), shoot length (cm), seedling vigour index, seedling fresh weight (g), seedling dry weight (mg), seed infection (%) and seed infestation (%) except for moisture and protein(%) were not differed significantly. The seeds were tested for quality parameters in the lab until the dormancy get broken. The study was carried from initial to 35 days and results were recorded at weekly intervals for 6 weeks. All the seed quality parameters except moisture and protein showed significant difference between the genotypes and chemicals persist till 35 days but their interaction effect have given non significant results from initial to till the end of 35 days in all the quality parameters except germination and dormant percent at zero and 7^{th} day of seed testing.

Due to Genotypes

In most of the parameters genotypes differed significantly throught the storage period where DGGV-2 have given highest values in dormant per cent (48.15, 42.82, 37.80, 34.79, 33.74, 27.92%), root length (11.46, 12.78, 13.48, 14.32, 15.22

and 15.69cm) shoot length (9.99, 10.76, 10.96, 11.18, 12.04 and 12.62cm), seedling dry weight (49.70, 53.09, 56.31, 58.17, 59.37 and 59.98g), vigour index (1104.68, 1346.02, 1520.17, 1662.86, 1806.25 and 2040.58), rate of germination (18.35, 19.28, 19.94, 20.42, 21.20 and 22.68), insect infestation (1.77, 2.49, 3.03, 3.73, 4.92 and 6.58%), pathogen infection (0.83, 1.51, 2.10, 2.81, 3.98 and 5.58), moisture content (11.88, 11.49, 11.26, 11.12, 11.01 and 10.84%), protein content (23.84, 22.96, 22.12, 22.38, 21.41 and 20.55%) followed by DGG-1 with dormant 48.11%, root length 11.25 cm, shoot length 9.60 cm, seedling dry weight 49.37g, vigour index 1081.91, rate of germination 17.80, insect infestation 1.63%, pathogen infection 0.80%, moisture content 11.77 and protein content 23.83 and Selection 4 with dormant 47.71 %, root length 11.12 cm, shoot length 9.33 cm, seedling dry weight 49.01g, vigour index 1069.33, rate of germination 17.54, insect infestation 0.56%, pathogen infection 0.72%, moisture content 11.61% and protein content 23.82% at starting of storage period(0 days). With the advancement of storage period all the parameters have increased drastically irrespective of the genotypes except in dormant %, moisture and protein. In germination parameter Selection 4 has given higher per cent followed by DGG-1 and DGGV-2. Among three genotypes DGGV-2 responded well for induction of dormancy, as dormancy was induced upto 35 days significantly high when compared to other genotypes and DGGV-2 responded well to chemical irrespective of chemical and concentration for reducing its enzymatic activity leading to germination which might be the sign for induction of dormancy.

Due to chemicals

Among the foliar application of MH, PB ad PEG at different concentrations reduced the germination of seeds in view of induction of dormancy as compared to control sample. Spraying of MH@ 1000 ppm was the most effective in inducing the dormancy as the germination was recorded (35.15, 44.47, 50.91, 56.79, 60.01, 64.04%) to a greater extent, it might be due to lethal inhibitory effect of MH. Which

was followed by PB 300 ppm and least in control. The two genotype had non dormant nature it could be seen from the control sample which recorded the highest per cent of germination (94.78, 94.59, 92.44, 93.50, 92.17, 91.37) the decreasing trend of germination per cent was due to the seed deterioration effect. The other concentrations of the chemicals failed to induce dormancy as much as MH@1000ppm, as the other dose concentration might have limited penetration and translocation of the chemical to the growing meristem.

Dormancy may block the sequential process involved in the germination. The work of earlier scientist revealed that the application of an inhibitor (MH) could bring about certain changes in the physiological and biochemical process. Another important conception was that, dormant and non dormant state of the seed was dependent on the relative levels of inhibitors and promoters present in the seed (Khan, 1977 and Bewley and Black.1982 in groundnut).

Since the MH is an auxin antagonist, the primary effect of MH on inducing dormancy seems to be interference in the tryptophan metabolism, as the tryptophan is the precursor in the synthesis of auxins (Karivaratharaju and Rao, 1972). Besides this, MH is found to increase the content of another amino acid, hydroxyproline (Karivatharaju and Rao, 1972 and Vaithialingum and Rao, 1973) which inhibited the auxin induced cell elongation (Cleland, 1963).

The introduction of antiauxins of the seed by means of foliar application at the time of seed development may suppress the auxin formation and induce dormancy (Lepold, 1984). Maleic hydrazide a growth and respiratory inhibitors, possesses the characteristics of antiauxin and has been found to be capable of inducing dormancy by antagonizing with auxin in groundnut, potato, sugarbeet, carrot, and rice by interfering in root growth and water absorption (Patterson *et al*., 1952; Wittwar and Hansen, 1951; Krishnamurthy, 1969). Maleic hydrazide application on onion plant

prolongs its dormancy through its effect on the level of natural growth inhibitor and promoters in the bulbs (Abdul-Rahaman and Issenberg, 1974).

The results obtained in the present investigation are in confirmation with the results reported by Nauriyal (2004), who have reported that MH sprayed @ 1000 ppm concentration induced dormancy much better in non-dormant groundnut varieties. Gupta *et al.* (1985) stated that effect of MH in inducing dormancy in groundnut varieties was found to be increased with the increase in the concentration and reported MH sprayed @ 20 x 10^3 ppm had induced more dormancy than 5 x 10^3, 10 x 10^3 and 15 x10^3 ppm. Randhawa and Nandapuri (1966) reported that MH sprayed @1000 ppm concentrations reduced the sprouting per cent in onion bulbs. Nagarjun *et al*. (1980) in groundnut and Abrar and Jadhav (1991) in peanut reported that 250 ppm and 200 ppm, respectively could induce dormancy in bunch groundnut seeds for a period of 3-4 weeks.

Next to MH @1000ppm, PB @300 ppm gave the high percentage of dormant seeds. Paclobutrazol, inhibit oxidative steps from *ent*-kaurene to *ent*-kaurenoic acid in the gibberellin pathway and are known to retard cellular elongation (Rademacher, 1991). Thus, the dormancy-inducing action of these inhibitors may be related to a block of GA-mediated processes controlling cellular elongation. John Marshall, 2000 reported that treatment with paclobutrazol reduced germination as well as root and shoot elongation, processes that could not be fully recovered by treatment with GA3.

The C_1 (control) recorded significantly the highest seedling vigour index (2648.15), rate of germination(23.73) and seedling dry weight (60.91g), followed by C9(1434.50, 17.88% and 50.90 mg respectively) and low in C2 (617.94, 16.15% and 45.91mg respectively). The MH sprayed @ 1000 ppm concentration recorded significantly lowest seedling vigour index (617.94) and seedling dry weight (45.91mg) during all the periods of testing. The reduction in seedling dry weight due to MH spray at 1000 ppm, might be due to inhibitory effect of growth retardants on

seedlings growth by affecting the shoot length, root length and also the stem elongation (Pandey and Sinha, 2006). The amount of growth retardants decreased during the active growth period of plants and increases during the period of suspension. Thus, reducing the biomass resulting in the low dry weight as compared to control . These results are in accordance with the report of Nagarjun and Radder (1983) in groundnut.

The per cent of insect infestation and pathogen infection influenced by different treatments revealed that the chemical treatment differed significantly with respect to both. The freshly harvested seeds showed less per cent of pest and pathogen damage and there was gradual increase in per cent as the storage period advanced.

The moisture and protein influenced by different concentration of chemicals gave non significant difference however they gradually decreased as the storage period prolonged.

5.2 Experiment – II: Influence of seed treatment by different dormancy inducing chemicals with three different genotypes on seed quality parameters of green gram seeds during storage

In the present study fresh seeds of green gram were treated with chemicals like MH (1000, 2000 and 3000 ppm), PB (100, 200 and 300 ppm) and PEG-6000 (18 and 26%) to know the effective chemicals to induce seed dormancy and to test the persistency of induced dormancy in lab condition. The treated seeds were stored in HDPE polyethylene bag (700 gauge) for 21 days until the dormancy gets break under ambient storage condition of Dharwad. Observations on different seed quality parameters were recorded on weekly basis and these results obtained are discussed here under by enlighting the available literature.

In the present study seed treated with dormancy inducing chemicals had a significant effect from initial to 21 days on germination (%), dormant (%), shoot

length (cm), root length (cm) and seedling vigour index, seedling dry weight(mg), rate of germination, insect infestation and pathogen infection but gave non significant results with moisture content (%) and protein(%).

All the quality parameters of seeds differed significantly between the genotypes in all days of storage period days after seed treatment which have given non significant difference.

Among the different seed treatments, green gram seeds with control sample have given the highest germination per cent(100%) root length (16.84, 16.83, 16.79 and 16.53 cm), shoot length (15.59, 13.99, 12.70 and 11.98 cm) , vigour index (3233, 3082, 2949 and 2851) seedling dry weight (60.56, 60.06, 60.22 and 58.83 mg), insect infestation (2.08, 2.17, 2.69 and 3.40%), pathogen infection (2.57, 3.08, 3.72, and 4.63 %), rate of germination 23.51, 23.06, 21.87 and 20.19%) and moisture (12.90, 12.19, 11.97 and 11.52%) from initial till 21st day, which have shown gradual decreased throught the period of storage. The seeds with control sample have given less or no dormant seeds compared to other chemicals. All the quality parameters have shown significant difference between the treatments till 21th day of storage where as only moisture and protein content from initial itself have shown non significant difference between the chemicals throught the storage. MH treatment resulted in conspicuous reduction of root and shoot length and speed of germination in the genotypes which is supported by Swarnalata *et al.,* 2008 in rice crop. Differential seedling growth inhibitory effect of MH in different genotypes has been reported by Das and Sinha (1965) in rice and Dash (1988) in wheat.

Among the different seed treatments the percentage of dormant seeds is more in the seeds treated with MH 1000 ppm (54.49, 43.12, 40.35 and 39.13%) followed by PB@300 ppm (53.25, 45.56, 35.86 and 35.66 %).these result might be due to lethal inhibitory effect of MH of growth retarding (dormancy inducing) chemicals on seed quality parameters.

Practical utility of the results

Based on the results of present study following findings are of practical application for inducing dormancy in green gram genotypes to avoid in situ germination in field.

Foliar spray in field and seed treatment in lab by MH @ 1000 ppm of green gram genotypes is effective in achieving higher growth, pod yield and seed yield and also quality especially the dormancy percentage.

1. Higher seed yield, yield contributing parameters and quality parameters can be obtained through foliar spray with MH @1000 ppm at flowering and pod initiation stage.
2. The dormancy induced in field level by MH @1000 ppm have induced dormancy at 64.85 % irrespective of genotypes
3. The dormancy induced by seed treatment have induced 54.49 % irrespective of genotypes.

Future line of work

1. The effect of dormancy inducing chemicals with different storage containers to enhance the keeping quality of dormant seeds may be studied.
2. Different seasonal effect along with dormancy inducing chemicals can be studied for proper induction of dormancy.
3. The same study can also be continued by using the chemicals at other different concentrations.
4. Changes in biochemical aspects during storage may be studied to know the effect of chemicals on seed quality.

6. SUMMARY AND CONCLUSIONS

The field experiment was conducted during *Kharif* 2014 at Main Agricultural Research Station, Dharwad, to study the dormancy inducing chemicals in green gram genotypes. The laboratory study was carried out during 2014 in the laboratory of the National Seed Project (NSP), University of Agricultural Sciences, Dharwad The lab experiment was laid out in two factorial Completely Randomized Design with and replicated three times. The field experiment was laid out in two factorial Randomized block Design with three genotypes and 27 treatments, replicated thrice. The important findings of this investigation are presented in this chapter.

6.1 Studies on effect of foliar spray of dormancy inducing chemicals on green gram genotypes

1) Pre –harvest spray of different dormancy inducing chemicals at different stages of crop growth showed significant difference for seed yield and quality attributes in green gram
2) Significant differences were noticed in the plant height due to dormancy inducing chemicals, foliar application of PEG 26% at 60DAS and at harvest stage. There was increase in the plant height over control except in foliar application with MH and PB, where there was a decrease in the plant height as compared to control.
3) Number of branches per plant and all yield components increased significantly due to dormancy inducing chemicals, the highest with MH @1000 ppm followed by PB @300 ppm at 60 DAS and at harvest stage compared to control and other treatments .
4) Seed germination percentage, root length shoot length, seedling vigour index, seedling dry weight, speed of germination, insect infestation and disease infection were significantly more in control without any treatment.

5) Foliar application of MH 1000@ ppm have induced dormancy upto 64.85 % irrespective of Genotypes followed by PB @ 300ppm with 63.34% of dormancy upto 35 days of storage.

6) The interaction effect of genotypes and chemicals gave non significant results except in germination and dormant percentage in which G_2C_1 gave high germination 95.33% and G_2C_2 gave high dormant seeds 65%.

6.2 Effect of seed treatment by different dormancy inducing chemicals with three different genotypes on seed quality parameters of green gram seeds during storage

1. Among the genotypes, DGGV-2 recorded significantly higher dormancy per cent, shoot length, root length, seedling vigour index, seedling dry weight , speed of germination, moisture and protein content as compared to DGG-1 and Selection 4.
2. Seed quality parameters like highest germination per cent, shoot length, root length, seedling vigour index, seedling dry weight and field emergence were found to be significantly higher with the control followed by PEG @ 26%. The other quality parameters like moisture and protein content gave non significant difference
3. The dormancy percentage was the highest with seeds treated with MH @1000 ppm (54.49%) followed by PB 300 ppm (53.25%).
4. The non significant differences were recorded in all the seed quality parameters due to interactions of genotypes and dormancy inducing chemicals except germination and dormant percent. However higher dormancy per cent was seen in the treatment combination of G_2C_2 (59.15%) and the lowest in G_2C_1 (0%)

It is concluded that the foliar spray of MH @1000 ppm at flowering and pod initiation stages induced dormancy without affecting seed yield and seed quality.

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STUDIES ON INDUCTION OF SEED DORMANCY IN GREEN GRAM (*Vigna radiata* L. Wilczek)

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ABSTRACT

The field experiment was conducted to study the seed dormancy induction in green gram genotypes during *kharif* 2014-15 at MULLaRP Scheme, University of Agricultural Sciences, Dharwad. Storage studies were carried out to test the artificially induced seed dormancy period in the seed research laboratory of National Seed Project, Dharwad, Karnataka. This experiment involved different concentrations of maleic hydrazide (1000, 2000 and 3000 ppm), paclobutrazol (100, 200 and 300 ppm) and PEG 6000 (18% and 26%) in three green gram genotypes *viz.,* DGG -1, DGGV-2 and Selection 4.

The result of field experiment revealed that among all genotypes and chemicals, foliar application of maleic hydrazide in DGGV-2 at flowering and pod initiation gave the higher number of branches (5.94), pods per plant (16.51), pod length (13.46cm), seeds per pod (14.77), seed setting percent (100), 1000 seed weight (41.52g), pod yield per hectare (922.38kg) and seed yield per hectare (706.78 kg/ha). It also recorded higher dormant seed (65 %), electrical conductivity (0.73dS/m) and lowest germination (35%), root length (9.82cm), shoot length (9.00cm), seedling vigour index (655), seedling dry weight (46.41mg), rate of germination (18.79%), seed infestation (0.00%) and seed infection (0.00%).

In storage studies the seeds treated with maleic hydrazide @ 1000 ppm in DGGV-2 recorded lower germination (40.85 %), root length (9.85cm), shoot length (9.00 cm), seedling vigour index (770), seedling dry weight (46.41mg), less seed infestation (0.51%), seed infection(0.00%), rate of germination (18.79%), with higher dormant seeds (59.15%) and electrical conductivity (0.77dSm^{-1}) which was followed by paclobutrazol @ 300 ppm (40.85%, 9.85 cm, 8.82 cm, 1088, 46.91 mg, 0.61%, 0.00%, 17.01%, 42.75 % and 0.76 dSm^{-1} respectively). These results indicate that 1000 ppm of maleic hydrazide treatment improved the seed yield, quality and storability in green gram and also higher percent of dormant seeds.