Gamma irradiation at a dose of 200 Gy can cause chlorophyll mutations in M_2 population as shown in Table 1. While the origin of the plant cultivars (control) there is no mutation of chlorophyll. According to [10], the chlorophyll mutation is an indication of genetic damage, which is characterized by the formation of chlorophyll in leaves. It was observed that at a dose of 200 Gy irradiation has produced a number of chlorophyll mutations are quite spacious with 7 different type of mutation, namely Albina, alboviridis, chlorina, virescen, tigrina, marginata, and striata. Some types of mutations that appear on M_2 nurseries can be seen in Figure 2.

Frequency of chlorophyll mutants in M_2 population can also be seen in Table 1. Of the seven types of chlorophyll mutations are formed, the number of mutations towards albino higher when compared with other types of chlorophyll mutations. Chlorophyll mutation frequency obtained 0.17% and 1.10% mutant frequency. It is lower when compared to the results reported by [31] by 7.7% on the variety Hitomebore [26] of 11.2% and 6.4% on the cultivar Kuriak Kusuik and Randah Putiah. Tinggi. Chlorophyll mutations that occur in a population of M_2 derived from gamma-ray irradiation at a dose of 200 Gy. a mutagenic effect of gamma irradiation at a dose indicating that the genetic diversity of the population has created M_2. [31] and [26] also reported that a dose of 200 Gy is the irradiation dose that is effective in generating useful genetic diversity in breeding programs.

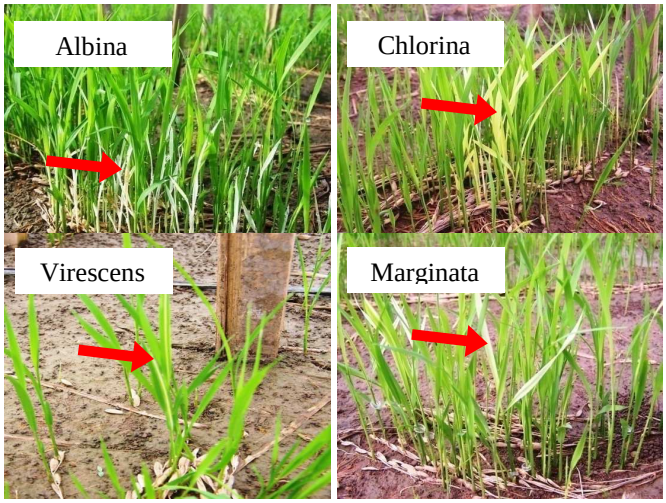

Fig. 2. Movements of chlorophyll which appeared on the M2 generation

At this stage M_2 mutant selection activity against the target (early maturity mutant) done. The selection can be done if there is a mutant strain in the population genetic diversity support to do the selection of the target mutant character [10]. Summary genetic parameter data observed through the variable plant height, panicle length, number of productive tillers and flowering dates can be seen in Table 2. In Table 2 it appears that in general it appears that heritability estimates on the overall character including the high category. Only the character of panicle length, which is estimated heritability was moderate, but can be classified nearing high. The high heritability estimates this means genetic factors make important contributions in the next process. Heritability shows how the proportion of a gene can be passed down to the next generation is based on observation of the nature of the observed phenotype [24], [30], as well as the genetic parameters determining the selection of effective systems [25], [30].

TABLE I
MUTATION TYPE OF CHLOROPHYLL MUTATION, TOTAL MUTATION, MUTATION FREQUENCY AND FREQUENCY OF MUTANTS IN IRRADIATION DOSE OF 200 GY

Kult. Junjung	Chlorophyll Mutation Type							Frek. Mutants (%)	Frek Mutations (%)
	Alb	Albo	Chl	Vir	Tig	Mar	Stri		
Total	993	78	567	136	6	193	3	1.10	0.17
Freq . of Mutants (%)	0.55	0.04	0.32	0.08	0.00	0.11	0.00	-	-

Description: The Alb (Albina), Albo (Alboviridis), Chl (Chlorina), Vir (virescens), Tig (Tigrina), Mark (Marginata), Stri (Striata)

TABLE II
GENERAL SUMMARY OF GENETIC PARAMETERS ON THE PART OF THE M2 POPULATION

Character	μ	Sd	σ^2 P	σ^2 e	σ^2 G	h^2	Category	2.Sd	Varia-bily
Plant Height (cm)	84.76*	±4.54	21.27	9.00	12.27	0.52	Tall	9.09	Wide
Tassel Height (cm)	26.48ns	±1.69	2.90	1.46	1.44	0.46	Medium	3.37	Tight
Numbers of Productive tillers	13.63ns	±2.37	5.71	2.13	3.58	0.60	Tall	4.74	Tight
Age of Flowering (Day)	94.85ns	±2.78	10.45	1.47	9.41	0.96	Tall	5.55	Wide

Note : *) significantly different at the 0.05 level according to the T test;
ns) were not significantly different

In addition, the value of variability in plant height and days to flowering is broad while the character panicle length and the number of productive tillers relatively narrow. This means that the induced mutation made more effective in generating high genetic diversity in plant height and days to flowering. But for the panicle length and the number of productive tillers do not have a great influence in generating genetic diversity. The extent of genetic variability in the character of the age of flowering and plant height are the basis for selection against a target mutant character (superior) which is desirable [10], [23], such as early maturing mutants and semi-dwarf. In observation of the middle value of a variable, it is known that the value of the variable character of mutant plants posture is lower when compared with the posture of plant origin. As for the value of the middle third of other variables that are not significantly different from the value of the middle of the plant origin. According to [30], the midpoint of each genotype is associated with idiotipe plants to be achieved and desired as semi-dwarf character and early maturity.

In the generative phase M_2 populations do individual selection against a target mutant (mutant early maturing and semi-dwarf). Results of individual selection against mutants early rippening and semi-dwarf can be seen in Table 3 and

Table 4. In Table 3 shows that the result of individual selection of the candidate mutant very early-maturing group (age 70-80 days flowering) that is as much as 8 plants, and the group of candidates mutant early maturing (flowering age 81-90 days) as many as 78 plants, the mutant frequency of 0.14%. As for the origin of plants (control) contained in the flowering age groups of 91-100 days. Mutant very early maturing and early maturing mutants with semi-dwarf can be seen in Figure 3.

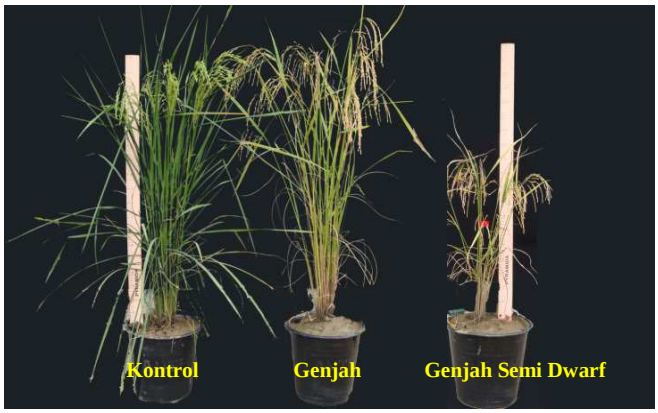

Fig. 3. Mutant very early maturing and early maturing mutants with semi-dwarf stature genetic improved results through induced mutation were found in M_2 population

At doses of gamma irradiation at a dose of 200 Gy can bring out the mutant as a result of genetic changes due to mutations in genes that control the age of the plant. From observations made rapid harvest age can be characterized by more rapid flowering mutant plant age when compared with native plants (plant control). According [12] days to flowering faster highly correlated with crop harvesting age faster. The rapid flowering plants due to genetic changes as a result of mutation induction is done. Treatment irradiation dose of 200 Gy is the dose that is effective for generating mutants is strategically desirable as mutant semi-dwarf and mutant early maturing [15], mutant grain hairless varieties Cisantana [22], and Mutant early maturing on rice Kuriak Kusuik and High White more low [26], early maturing mutants and semi-dwarf in rice Ase Field and Mandoti [9].

TABLE III
EARLY MATURING MUTANT IN M2 POPULATION DERIVED FROM CULTIVARS JUNJUNG

Tread	Age for Flowering (day)			Numbers of Mutans	Numbers of Populations M_2	Frek.Early-maturing Mutans (%)
	70-80	81-90	91-100			
Mutans of Junjung	8	78	-	86	60.000	0.14
Kult. Junjung (Control)	-	-	TF 50	-	6.000	-

Note: TF50 (*Time Flowering* for Plant Control 50%)

In addition to producing the mutant-old early maturing, irradiation necessary also produce mutants dwarf and semi-dwarf. Results of selection of mutant dwarf and semi-dwarf can be seen in Table 4. Generally, in early maturing mutant phenotype candidate has a lower posture (semi-dwarf) when compared with native plants idiotipe. When connected with genetic parameters, in addition to the character of the age of flowering plants, plant height also has a wide genetic diversity values (see table 2).

TABLE IV
MUTANT DWARF AND SEMI-DWARF IN M_2 POPULATION OF DERIVED FROM CULTIVARS JUNJUNG

Thread	Postur of Plant		Numbers of Mutans	Numbers of Populations M_2	Frek.Early-rippening Mutans (%)
	Dwarf	*Semi-Dwarf*			
Mutans of Junjung	27	70	97	60.000	0.16
Frek. Mutants (%)	0.05	0.12			

In Table 4 it is known that the mutant dwarf mutants obtained as many as eight candidates and semi-dwarf mutants obtained as many as 70 candidates mutant with a mutation frequency of 0.16%. This frequency is lower than the frequency of mutant dwarf and semi-dwarf those reported by [3] in the amount of 0.30% on the cultivar Madhu Malti at a dose of 250-350 Gy irradiation [28], which is 0.26% in strain Kl 237 with irradiation dose of 200 Gy.

IV. CONCLUSIONS

Based on the research that has been done can be concluded that the mutation induction is done by gamma ray irradiation can generate genetic diversity is very useful in the selection efforts to obtain the characters age more early maturing crops (early maturing mutant). Orientation doses of LD50 values obtained at 497.04 Gy, but in determining the expected effective dose irradiation doses causing little physical damage as well as a large genetic damage. At a dose of 200 Gy irradiation produced little physical damage as a percentage of germination, seedling height, root length and panicle void percentage when compared with the higher dose of irradiation and generate genetic diversity seen from the emergence of chlorophyll mutation with a mutation frequency of 0.17%. At these doses also has established extensive genetic diversity for the variable character of the age and height of the plant. With the extent of genetic diversity of the resulting mutant candidates that can be selected at this stage of M2. From the selection made at the stage of early maturing mutant M2 candidates obtained as many as 86 candidates with the mutation frequency of 0.14%, as well as dwarf mutant and semi-dwarf mutant were 97 mutants with mutant frequency of 0.16%, Candidates mutant is a mutant candidates hope to have better character as a result to be developed in the future.

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