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RESEARCH ARTICLE

CUTTING ABILITY AND GROWTH OF THREE COVER CROPS [ARACHIS PINTOÏ (L.) KRAPOV & W.C. GREG.; ARACHIS REPENS (L.) HANDRO ;DESMODIUMADSCENDENS(SW.) DC.]IN NURSERY

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Abstract

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In the search for alternative practices to the excessive use of herbicides for control of weediness, strategies based on the domestication and multiplication of cover crops are more and more explored. The propagation by cuttingof these plants have been the subject of numerous studies because of unavailability andcost-prohibitive of their seeds. The aim of this study was to compare the growthandcuttingabilityof*A. repens*, *A. pintoï* and *D.adscendens*. These cover plants were propagated by cutting in coir and put on raised bamboo clays with shade, in greenhouse. For each specie, parameters of vegetative recovery and growth were assessed. The results reported that recovery abilities were most important to*A. pintoï* (89.35%) and *A. repens* (86.39%). However, plant growth was better for *D. adscendens*, with a vigour index more than double with that ofboth theother species. The results obtained show that these three cover crop species are relatively easy to propagate by cutting in nursery.*D. adscendens* and *A. repens* are potentially usable in large scaleas cover cropstocontrol weeds in agricultural parcels.

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Introduction:-

Weeds, in addition to crop competition, often promote diseases and pests that cause significantlossesof harvests(Tano *et al.*, 2016). The use of broad-spectrum, effective synthetic herbicides such as the Glyphosate remains the most common practice among the control strategies (Goscinny&Hanot, 2012). However, much research has highlighted the adverse effects of this practice, both on humans and environment, by various kinds of pollution (Clair *et al.*,2012; Ahmad &Danish, 2018). With the aim to directing culture systems towards practices that address sustainable agriculture and food security(Tilman *et al.*, 2002 ; Tubiana &Jacquet, 2007), cover crops able to suppress weeds are more and more presented as alternative instead of chemical weeders (Fongod *et al.*, 2010 ; Tixier *et al.*, 2011 ; Tardy *et al.*, 2015 ; Sanou *et al.*, 2017). Among these, they are Fabaceae of *Arachis* and *Desmodium* genera. Their establishment requires seed availability (Melfort, 2010). Even if the direct seeding is more widespread(Kouadio *et al.*, 2009), the production and especially seed harvest of many cover crops are difficult. In addition, seed costs are high when available. Moreover, a loss of germinability may occur during their conservation(Alleidi *et al.*, 2016). Thus, vegetative propagation by cutting in nursery seems a reliable and inexpensive option (Degrande &Facheux, 2002).

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This study focused on availability improvement of *Arachis pintoï*, *Arachis repens* and *Desmodium adscendens*, to use them as cover crops to control the weedinessin agricultural parcels. It will be necessary to compare, in a nursery, the ability to propagation by cutting and the growth of these three species from the local flora.

Study site

The study was carried out at Akressi, inthe South Comoe region ofCôte d'Ivoire(Figure 1), on the station of the Agricultural Company Kablan Joubin (SAKJ), abanana producer (5° 38'24.13" North, 3° 5'13.95" West and 93 m of altitude). The climate, wet tropical, is characterized by two dry and two rainy seasons. Average temperature is around 26.4 °C, with a low daily amplitude (Essis, 2016 ; Camara *et al*., 2018). Annual rainfall is higher than 2,000 mm (Kouamé *et al*., 2009).

Plant material

A. repens, *A. pintoï* and *D. adscendens*(Leguminosae) runners were used as plant material. The first two species were provided by the stations of the study site and of the National Centre of Agronomic Research (CNRA) at Bouaké, respectively. The last one specie was collected in palm and rubber trees undergrowth located near of the study site. The shoot fragments used in the trials were taken from the plants, at the vegetative stage of their development cycle.

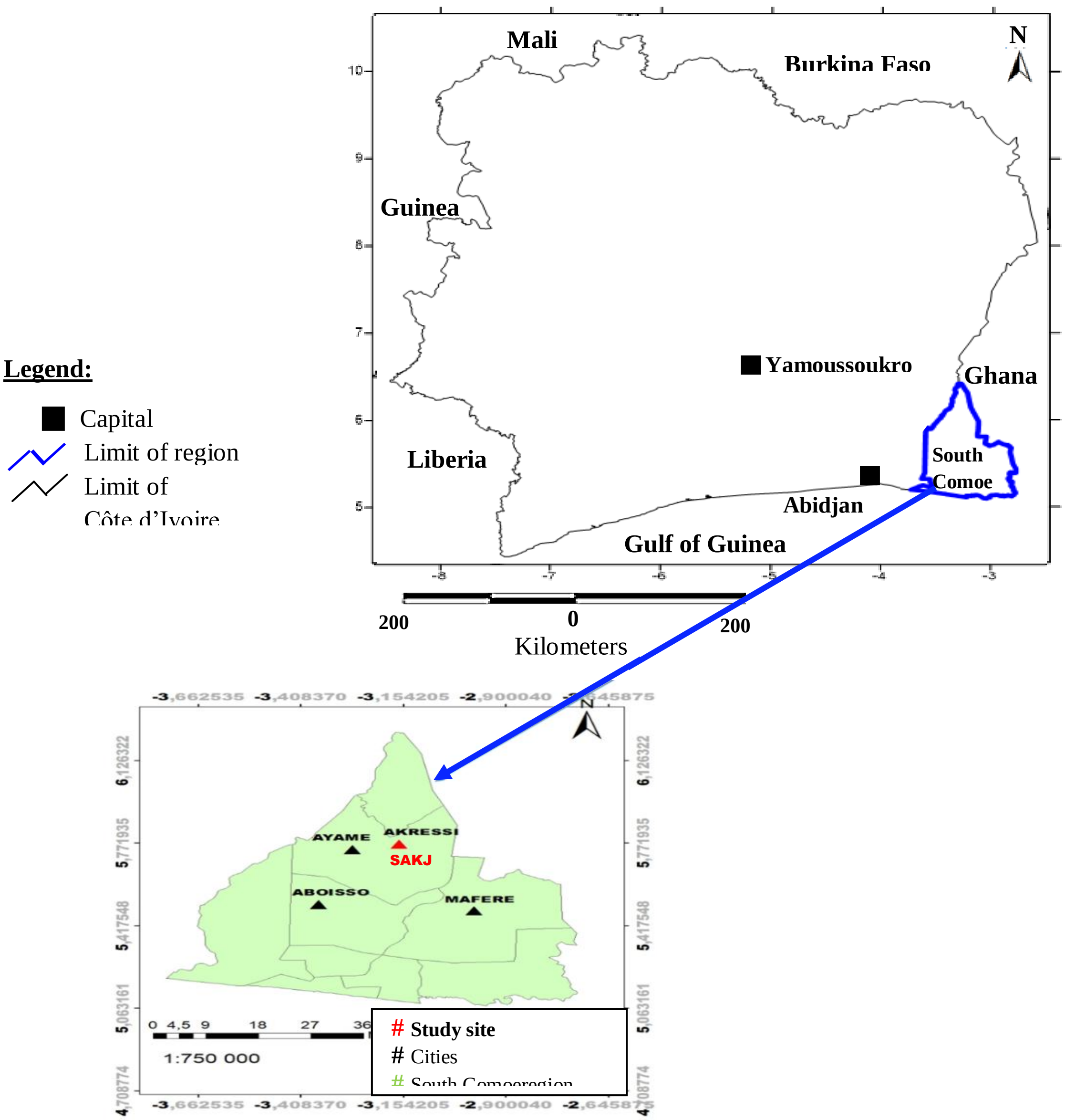

Figure 1:- Localization of the study area in the South Comoe region of Côte d'Ivoire.

Methodology:-

Preparation of the culture medium

The coir used previously for acclimatization of banana vitroplants was used as a substrate for the propagation by cutting. This one was carried out in alveolate plates. The preparation of the culture medium consisted in the filling of alveoli with the substrate.

Cuttings preparation and culture

The runners of plants collected were cutup in fragments comprising five to six nodes, with the aid of scissors, while taking care to pare them. Cuts were realized near of the nodes having to be buried in the substrate. The preparation of the cuttings was done in the morning, before the hot periods, to limit their dehydration. Then, those were planted immediately in the alveoli of the plates ready. With the aid of a little stick out of wooden, a hole was made in the substrate and the cuttings were inserted there vertically until under the third node (Rosenn &Denis, 2004) at a rate of a fragment per alveolus. A light pressure exerted on the substrate made it possible to pack and to compact it around the cutting. Before and after the cuttings sowing, the substrate was well watering. Lastly, alveolate plates were placed on raised (around 1 m) bamboo clays and laid out shade inside a greenhouse.

Trial care

For the trial care, watering were carried out every two days in order to maintain humidity in the substrate. About 2 litres of water per alveolate plate was applied to each application using a watering can (15 litres). Moreover, a sanitation treatment of the greenhouse against pests was made weekly by an application of an insecticidefungicide mixture (Deltamethrin 12 $g.l^{-1}$ EC,$l.ha^{-1}$;Mancozeb 800 $g.kg^{-1}$WP,2 $kg.ha^{-1}$),withtheaidofabackatomizer engine.

Experimental design

The trial was designed in Fisher's block with six replications of three treatments. The studied factor was cover cropspecies with the modalities *A. pintoï*, *A. repens* and *D. adscendens*. Each alveolate plate was equivalent to a replication of a treatment (modality of the factor) and contained 77 alveoli (7 alveolus x 11 sowing lines) perforated. Each alveolus (4 cm x 4 cm x 5 cm) received a cutting. The plates of an individual surface to 0.15 m² (50 cm x 30 cm) were separated from 10 cm from/to each other. The number of shoot fragments by alveolate plate, by specie and for all the experimentation was 77, 462 and 1,386.

Data assessment on vegetative recovery of cuttings

The vegetative recovery of a cutting was characterized by the complete deployment of its first leaf starting from the vegetative buds after their dormancy breaking (Diatta *et al.,* 2007).

Recovery delay and duration

The recovery delay is the latency time (days), that elapses between the date of the propagation by cutting and that of the emergence of the first leaf in each alveolate plate. Concerning the recovery duration, it defines the time (days) that elapses between the first and the last recovery of the cuttings within an alveolate plate.

Recovery capacity

Also called recovery rate, it is obtained by the quotient of the number of cuttings that have recovered growth and that initially planted, reported to 100.

Data assessment on the vegetative growth of seedlings resulting from the cuttings

Assessment on the vegetative growth of the seedlings resulting from the cuttingsconcerned 11 individuals. Those were selected randomly in the six alveolate plates made for each cover crop specie. Then, they were numbered and marked by means of stickers.

Survivalrates

It was assessed 84 days after the propagation by cutting in nursery, when plants were sufficiently developed for transplantation in parcels. The survival rate of each specie was determined by the quotient of the size of plantsthat have survived, and the number of those that have recovered growth, reported to 100.

Stem growthvelocity

The mean velocity of plant stemgrowth was evaluated between the 14th and 84th days after the sowing of cuttings in alveoli. At these times indicated, the length of the air axis was measured in centimetres (cm), from the collet to the apical end of the main stems using a tape measure. The mean velocity of growth was expressed in cm/day.

Numbers of internodes, leaves and stemramifications

Twenty-eight days after the propagation of cover crops by cutting in alveolate plates, emerged internodes, leaves and stem ramifications were determined by counting every 28 days until the end of the tests. Values were reported by a plant.

Root and stem lengths, stem diameters and vigour index

Plant vigour index was appreciated 84 days after the propagation by cutting. The quotient of the length (cm) on the diameter (cm)taken at the stem colletallowed to calculate it. Stem diameter was measured using a mechanic slide calliper (Mitutoyo model). In addition, at the same time, the length (cm) of plant roots (pivot) was measured from the insertion pointsto their apex.

Covering rates

During the growth of plants, the covering rate of alveolate plates by the foliar biomass produced by the cover crops was determined every 28 days, according to the specie. For an observation, the value obtain represents the surface that the specie would occupy, if the shoot parts of this one are projected vertically on the surface of the plate. Thus, the covering dynamic evokes the temporal evolution of this surface. It is expressed as a percentage.

Fresh and dry biomass

At the end of tests (84 days after the cutting), all plants were retrieved from the alveolate plates. Fresh biomass (FBm) of the whole plant, shoot and root parts were determined by weighing with a Sartorius precision balance (0.01 g). Thedry biomass (DBm) were also obtained after dehydration during 24 H in a ventilated drying oven (Memmert model) at the temperature of 105 ^{o}C.

Statistical analysis of data

Statistical tests were performed using the SPSS Statistics software version 23 (IBM, USA). Data collected were subjected to analysis of variance (ANOVA). In case of rejection of the hypothesis of equality between the treatments, means were separated in homogeneous groups with the aid of the multiple comparison test of Student-Newman-Keuls at the threshold $\alpha = 5\%$.

Results and Discussion:-

Results:-

Recovery delays, durations and capacities of cuttings

The cover crops recovery delays and durations did not vary according to the specie (p>0.05) on the contrary to the recovery capacities that fluctuated significantly (Table 1). For the first two parameters evoked, values were statistically identical, whatever the specie, with respective overall averages of 4.00 and 11.94 days. About to the recovery capacities, the highest values were recorded to *A. pintoï* (89.35%) and *A. repens* (86.39%).

Survival rates and stem growthvelocitiesof plants

Survival rates of plants were statistically identical, whatever the specie of cover crops(p>0.05) with an overall average of 89.14% (Table 2). On the other hand, mean velocities of plants stem growth varied to a significant degree (p=0.000). *D. adscendens* is the specie for which growth velocity was highest (0.12 cm/day), the lowest value was reportedfor*A. pintoï* (0.08 cm/day).

Numbers of internodes, leaves and stem ramifications of plants

Cumulated numbers of internodes, leaves and stem ramifications per plant of each cover crops specie, according to the time after the propagation by cutting, are mentioned in tables 3, 4 and 5, respectively. Overall, they varied significantly from one specie to another (p=0.000). Whatever the parameter considered, *D. adscendens* is the specie that recorded the highest values on over all the assessment period. For *A. pintoï* and *A. repens*, averages observed were the lowest and statistically identical, especially from the 56th day after the sowing of cuttings.

Table 1:- Cuttings recovery delays, durations and capacities according to the cover crop species.

Cover crop species	Recovery delays (days)	Recovery durations (days)	Recovery capacities (%)
A. repens	3.67 ± 0.82 **a**	13.50 ± 4.59 **a**	86.39 ± 6.48 **a**
A. pintoï	4.00 ± 0.00 **a**	12.00 ± 3.69 **a**	89.35 ± 3.71 **a**
D. adscendens	4.33 ± 0.52 **a**	10.33 ± 1.21 **a**	76.35 ± 8.16 **b**
Overall averages	4.00 ± 0.59	11.94 ± 3.71	84.03 ± 10.62
p-value (p)	0.151	0.143	0.000
Significativities	NS	NS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. NS: nonsignificant (p>0.05); VHS: very highly significant (p <0.001)

Table 2:- Plant survival rates and mean velocities of stem growth, 84 days after the sowing of cover crop cuttings, according to the species.

Cover crop species	Plant survival rates (%)	Mean velocities of plants stem growth (cm/day)
A. repens	86.08 ± 3.63 **a**	0.10 ± 0.06 **b**
A. pintoï	88.28 ± 2.38 **a**	0.08 ± 0.03 **c**
D. adscendens	93.05 ± 6.79 **a**	0.12 ± 0.05 **a**
Overall averages	89.14 ± 5.30	0.10 ± 0.06
p-value (p)	0.055	0.000
Significativities	NS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. NS: nonsignificant (p>0.05); VHS: very highly significant (p <0.001)

Table 3:-Cumulated numbers of the cover crop internodesaccording to the specie and the time after the propagation by cutting.

Cover crop species	Cumulated numbers of internodes per plant		
	Days after the propagation by cutting		
	D28	**D56**	**D84**
A. repens	7.82 ± 1.83 **a**	10.27 ± 2.00 **b**	14.70 ± 3.23 **b**
A. pintoï	6.54 ± 1.56 **a**	8.94 ± 1.71 **b**	13.18 ± 3.27 **b**
D. adscendens	7.42 ± 1.61 **a**	13.30 ± 7.93 **a**	19.45 ± 10.17 **a**
Overall averages	7.26 ± 4.89	10.84 ± 5.11	15.78 ± 6.92
p-value (p)	0.247	0.001	0.000
Significativities	NS	HS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. NS: nonsignificant (p>0.05); HS: highly significant (p <0.01); VHS: very highly significant (p <0.001).

Table 4:- Cumulated numbers of the cover crop leaves according to the specie and the time after the propagation by cutting

Cover crop species	Leaves cumulated numbers per plant		
	Days after the propagation by cutting		
	D28	**D56**	**D84**
A. repens	3.54 ± 1.06 **b**	5.00 ± 1.68 **b**	7.42 ± 2.31 **b**
A. pintoï	2.21 ± 1.05 **c**	3.91 ± 0.98 **b**	6.03 ± 2.02 **b**
D. adscendens	4.30 ± 2.13 **a**	8.45 ± 4.38 **a**	10.76 ± 6.33 **a**
Overall averages	3.35 ± 1.72	5.79 ± 3.36	8.07 ± 4.49
p-value (p)	0.000	0.000	0.000
Significativities	VHS	VHS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. VHS: very highly significant (p <0.001)

Table 5:- Cumulated numbers of the cover crop stem ramifications according to the specie and the time after the propagation by cutting.

Cover crop species	Stem ramifications cumulated numbers per plant		
	Days after the propagation by cutting		
	D28	D56	D84
A. repens	1.36 ± 0.96 **b**	1.70 ± 1.10 **b**	1.76 ± 1.06 **b**
A. pintoï	0.64 ± 0.78 **c**	1.54 ± 0.83 **b**	1.76 ± 0.87 **b**
D. adscendens	2.51 ± 1.33 **a**	3.52 ± 1.59 **a**	3.97 ± 1.51 **a**
Overall averages	1.5 ± 1.30	2.09 ± 1.38	2.15 ± 1.30
p-value (p)	0.000	0.000	0.000
Significativities	VHS	VHS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. VHS: very highly significant (p <0.001)

Root and stem lengths, stem diameters and vigour index of plants

Significant effects (p=0.000) of the cover cropspecie on the root and stem lengths, stem diameters and vigour index at the end of the tests were observed and are indicated in the table 6. The highest root lengths were reported to *A. repens* (9.46 cm). For the length of stems, average values the most important were recorded to *D. adscendens* (19.80 cm) and *A. repens* (18.16 cm) plants. In addition, diameters taken at stem collet of*A. repens* (0.40 cm) and *A. pintoï* (0.39 cm) were statistically the most important and approximately the doubles in comparison with that of *D. adscendens* (0.22 cm). Concerning the vigour index, *D. adscendens* is the specie that recorded the most important value (90.00), the lowest having been that of *A. pintoï* (39.05).

Fresh and dry biomass of plants

Biomass of the root and shoot parts and of the whole plant, as well fresh as dry (Table 7) were dependent on the cover crop specie (p=0.000). The highest values were recorded to *A. repens* while the lowest were reported to *D. adscendens*.

Table 6:- Root and stem lengths, stem diameters and vigour index of plants, 84 days after the propagation of cover crops by cutting, according to the specie.

Cover crop species	Root lengths (cm)	Stem lengths (cm)	Stem diameters (cm)	Plant vigour index
A. repens	9.46 ± 1.65**a**	18.16 ± 4.91 **a**	0.40 ± 0.08 **a**	45.04 ± 3.63 **b**
A. pintoï	8.47 ± 1.28**b**	15.23 ± 2.65 **b**	0.39 ± 0.06 **a**	39.05 ± 2.20 **c**
D. adscendens	7.89± 0.90**b**	19.80 ± 3.02 **a**	0.22 ± 0.03 **b**	90.00 ± 9.80 **a**
Overall averages	8.61 ± 1.45	17.73 ± 3.98	0.33 ± 0.10	58.03 ± 5.58
p-value (p)	0.000	0.000	0.000	0.000
Significativities	VHS	VHS	VHS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. VHS: very highly significant (p <0.001)

Table 7:- Cover crops fresh and dry biomass, 84 days after the propagation by cutting, according to the specie and the plant parts.

Cover crop species	Fresh biomass per plant (g)			Dry biomass per plant (g)		
	Root parts	Shoot parts	Whole plants	Root parts	Shoot parts	Whole plants
A. repens	0.53 ± 0.03 **a**	3.25 ± 0.67 **a**	3.78 ± 0.65 **a**	0.09 ± 0.00 **a**	0.62 ± 0.08 **a**	0.70 ± 0.07 **a**
A. pintoï	0.16 ±	1.98 ±	2.14 ± 0.23 **b**	0.03 ±	0.38 ±	0.41 ±

	0.03 **b**	0.20 **b**		0.00 **b**	0.03 **b**	0.03 **b**
D. adscendens	0.14 ± 0.00 **b**	0.95 ± 0.12 **c**	1.08 ± 0.11 **c**	0.03 ± 0.00 **b**	0.24 ± 0.01 **c**	0.27 ± 0.01 **c**
Overall averages	0.28 ± 0.19	2.06 ± 71.06	2.34 ± 1.23	0.05 ± 0.03	0.41 ± 0.17	0.46 ± 0.20
p-value (p)	0.000	0.001	0.000	0.000	0.000	0.000
Significativities	VHS	HS	VHS	VHS	VHS	VHS

In a same column, values followed by the same letter are not significantly different at the threshold α = 5% according to the Student-Newman-Keulstest. HS: highly significant (p <0.01); VHS: very highly significant (p <0.001)

Plants covering rates

The covering rate evolution of the three studied plant species according to the time after the propagation by cutting reported a constant growth (Figure 2). However, at the end of the tests (84 days after the sowing of cuttings), the highest value was observed to *D. adscendens* (91.67%) relatively to those of *A. repens* (66.67%) and *A. pintoï* (51.67%). It was the same for the covering rates recorded at the 56th day after the sowing of cuttings.

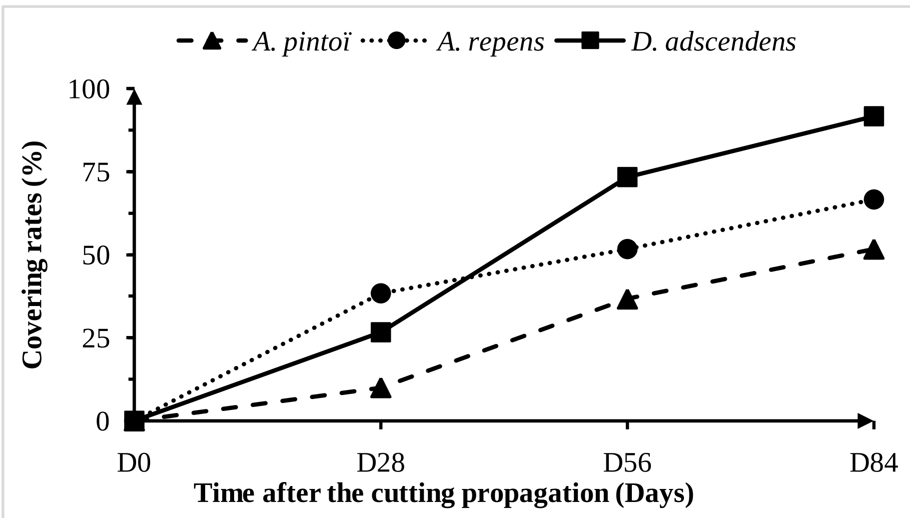

Figure 2:- Covering rate evolution according to the specie of cover crops and the time after the propagation by cutting.

Discussion:-

Vegetative recovery

Overall, the results of stem fragments propagated by cutting rarely revealed significant distinctions between *A. pintoï*, *A. repens* and *D. adscendens*. For the recovery delays, it is evident that latency of 4 days is that of these three legumes required to recover growth. It is the same with the 12 days necessary to observe the maximum of recovery. These delays and durations similar whatever the speciecould be due to the time required for activation of the use process of reserves contained in cuttings planted.Indeed, their recovery is mainly due to the use of own resources (carbohydrate) and less to the photosynthetic activity (Hartman *et al*., 1997). Delays of 3 to 6 days, substantially the same to those observed in this study, were reported to *Manihotesculenta* after propagation by cutting (Peter & Ray, 2000). The highest recovery capacities observed to *A. pintoï* and *A. repens* could suggest a difference in the recovery quality of cuttings according to the specie (Zida *et al*., 2018). This would be a function of their physiological state and health conditions (Touré *et al*., 2013), particularly the good initial water content that would have avoided the desiccation of buds present on the cuttings before activation of the recovery process. The lowest recovery capacity reported to *D. adscendens* would be related to the lowest diameter of its cuttings as reported in this study. Such cuttings contain relatively few water and nutrients quantities necessary to ensure root emergence and elongation (rooting) and consequently optimal recovery (Kengue & Tchio, 1994). In addition, recovery capacities were higher than about 76% for the three species. This would be due to the good properties (porosity, water retention capacity, air circulation, pH, etc.) of the coir used assubstrate(Tsobeng *et al*., 2011 ; Hassanein, 2013 ; Paluku *et al*., 2018), to the optimal conditions meetinthe greenhouse(Bellefontaine *et al*., 2018) and the juvenile age of used cuttings(Urban & Urban, 2010 ; Bellefontaine *et al*., 2010 and 2013).The high recovery capacities as well as the delays and durations relatively short whatever the specie reveals that *A. pintoï*, *A. repens* and *D. adscendens* are relatively easy to propagate by cutting in nursery. Asseh *et al*. (2017) ended up to the same deduction for *Thunbergia atacorensis* after obtaining a recovery delay of 11 days, latency relatively longer than that observed in the present study.

Vegetative growth

Plant survival rates did not vary, whatever the specie, with average values higher than 85%. This observation could be explained by the favourable environmental factors, particularly sufficient light intensity in the shade house. Indeed, the correct illumination of plants ensure to those a carbon balance that allowing them to maintain and develop (Peracy, 1987). In addition, excepted for some Dipterocarpaceae, the majority of tropical plants have high survival rates when they are grown under light, but out of the direct sun(Augspurger, 1984). The growth parameters (number of internodes, of stem ramifications, of leaves, covering rates, lengths, vigour index) were important to *D. adscendens*. This observation would express a very pronounced nutritional propertiesforthis specie. It is related in first, to the efficiency of interception and conversion of sun radiation available in plant organs and matters under the shade house and in second, to the specie genotype(Fondio *et al*., 2003; Abidi, 2013; Toudou *et al*., 2017). A similar result was obtained in studies about *Guibourtiaehie*(Kouadio *et al*., 2013), where it was reported that averagely sunny medium (shaded) induces a better growth dynamic after propagation by cutting probably due to a most important velocity of mitoses (Benamar, 2009). Regarding the fresh and dry mass of emitted parts, the best performances were observed to *A.repens* then to *A.pintoï*, in spite of fewer large average numbers of these entities per plant. These observations are in contrast with those reported in other papers that show that the quantity of produced biomass depends on the plant vegetative growth (Dabré *et al*., 2016). Explanation could be residing in stem calibre most important to *A.repens* and *A.pintoï*.Moreover, previous studies carried out by Muanda (2010) and Husson *et al*. (2012) reveal dimensions and numbers of leaflets most higher for the two perennial peanut species (*A.repens* and *A.pintoï*) relatively to *D. adscendens.*

Conclusion:-

By referring to the high recovery capacities and the recovery delays and durations relatively short, as well as high survival rates, we can say that *D. adscendens* and particularly *A. repens* and *A. pintoï* are fit to propagate by cutting in nursery. However, after the recovery of growth, *D. adscendens* got the most important vegetative growth, followed at a least degree to that of *A. repens*. Thus, on the basis of their growth potentialities relatively high in nursery, *A. repens* and *D. adscendens* could be suggested as cover crops in order to control the weediness in agricultural parcels.

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Conflict of interests:

The authors declare that there is no conflict of interest for this manuscript.

Contributions of the authors:

This work was carried out in collaboration among all authors. EYGK ensure the collection, handling experimental, analysis of the data and drafting of the manuscript. The other authors, particularly AED, took part in the data analysis and the paper correction and improvementaccording to journal requirements.All the authors read and approved the final manuscript.

References:-

1. **Abidi F. 2013.** Effet de la qualité de lumière sur l'élaboration de l'architecture du rosier buisson. Thèse de Doctorat, Biologie Végétale, Université d'Angers, France, 222 p.
2. **Ahmad T. & Danish M. 2018.** Prospects of banana waste utilization in wastewater treatment: A review. *Journal of Environmental Management*, 206: 330-348. https://doi.org/ 10.1016/ j.jenvman. 2017.10.061.

3. **Alleidi I., Hamidou F., Inoussa M.M., Bakasso Y. & Zongo J.D. 2016.** Caractérisation agromorphologique des accessions d'arachide (*Arachis hypogaea* L.) pour la teneur en huile. *European Scientific Journal*, 12 (15): 337-351.
4. **Asseh E.E., Aké-Assi E., Kouassi A.J. & N'guessan K.E. 2017.**Domestication de *Thunbergia atacorensis* Akoegninou et Lisowski (Acanthaceae) : Effet du type de substrat et du mode d'éclairement sur l'aptitude à la reprise végétative des boutures et la croissance des plants. *European Scientific Journal*, 13 (18): 328-354. http://dx.doi.org/10.19044/esj.2017.v13 n18p328.
5. **Augspurger C.K. 1984.** Light requirements of neotropical tree seedlings: a comparative study of growth and survival. *Journal of Ecology*, 72: 777-795.
6. **Bellefontaine R., Ferradous A., Alifriqui M. & Montuis O. 2010.** Multiplication végétative de l'arganier (*Argania spinosa)* au Maroc : le projet John Goelet. *Bois et Forêts des Tropiques*, 304 (2) : 47-59.http://bft.cirad.fr/ cd/ BFT_304_47-59.pdf
7. **Bellefontaine R., Ferradous A., Alifriqui M., Fikari O. & El Merchts S. 2013.** Mobilisation de vieux arganiers par bouturage sous nébulisation artificielle, pp. 145-154. In*:* Actes du premier congrès 101 international de l'arganier, 2011/12/15-17, Agadir, Maroc, INRA-Maroc Ed., 516 p. http://www.inra.ma/Docs/actesarganier/arganier145154.pdf
8. **Bellefontaine R., Meunier Q., Ichaou A., Morin A., Mapongmetsem P.M., Belem B., Azihou F., Houngnon A. & Abdourhamane H. 2018.** La régénération par graines et par multiplication végétative à faible coût (drageons et boutures de segments de racine), CIRAD, 460 p.
9. **Benamar B., Daguin F. & Kaid-Harche M. 2009.**Effet du stress salin sur la germination et la croissance *in vitro* du pistachier (*Pistacia vera* L.). *Comptes Rendus Biologies*, 332 : 752-758.
10. **Camara B., Badou O.J., Chérif M., Kassi K.F.J-M., Tuo S., Kouadio P., Ouattara G., Kouamé K.D., Amari L.-N.D.G.E., Sanogo S. & Koné D. 2018.** Effect of a mineral fertilizer (Herbagreen®) on the growth of dessert banana (*Musa*, Grande Naine) and resistance to Black Sigatoka cultivated in the area of Aboisso (Côte d'Ivoire). *International Journal of Agronomy and Agricultural Research*,2 (6): 175-185.
11. **Clair E., Mesnage R., Travert C. & Séralini G. 2012.** A glyphosate-based herbicide induces necrosis and apoptosis in mature rat testicular cells *in vitro*, and testosterone decrease at lower levels. *Toxicology in Vitro*,26: 269-279.
12. **Dabré A., Hien E., Somé D. & Drevon J.J. 2016.** Impacts des pratiques culturales sur la production du sorgho (*Sorghum bicolor* L.) et du niébé [*Vigna unguiculata* (L.) Walp] et sur le bilan partiel de l'azote sous niébé au Burkina Faso. *International Journal of Biological and Chemical Sciences*, 10 (5): 2215-2230.http://dx.doi.org/10.4314/ijcbs.v10i5.22.
13. **Degrande A. & Facheux C. 2002.** Production et commercialisation des plantes produites dans les pépinières villageoises. Guide pratique pour formateurs, encadreurs et pépiniéristes. ICRAF West Africa. World Agroforestry Centre, 52 p.
14. **Diatta S., Houmey V.K., Zoungrana K.C.Y., Banoin M. & Akpo L.E. 2007.** Possibilité de multiplication végétative par bouturage chez un ligneux fourrager sahélien: *Maerua crassifolia* (Forsk), Capparidaceae.*Afrique Science*, **03**(2): 271-283.
15. **Essis B., Kobenan K., Traoré S., Yatty J., Koné D., Aby N. & Thiémélé D.E.F. 2016.** Pression d'inoculum de la maladie des raies noires (MRN) causée par *Mycosphaerella fijiensis* Morelet, dans les plantations industrielles de bananiers, en Côte d'Ivoire. *European Scientific Journal*, 12 (3): 37-52.http://dx.doi.org/10.19044/esj.2016.v12n3p37.
16. **Fondio L., Djidji H.A., Kouamé C. & Traoré D. 2003.** Effet de la date de semis sur la production du gombo (*Abelmoschus* spp.) dans le centre de la Côte d'Ivoire. *Agronomie Africaine*, 15 (1) : 13-27.
17. **Fongod A.G.N., Focho D.A., Mih A.M., Fonge B.A. & Sama L.P.2010.** Weed management in banana production: The use of *Nelsonia canescens* (Lam.) Spreng as a non-leguminous cover crop. *African Journal of Environmental Science and Technology*, 4 (3): 167-173.
18. **Goscinny S. & Hanot V. 2012.** Le glyphosate dans tous ses états. Institut Scientifique de Santé Publique, Unité Pesticides, Labinfo, 12-16.
19. **Hartman T.H., Kester E.D., Davis T.F.Jr. & Geneve R.L. 1997.** Plant propagation: principles and practices. 6è edition, *Prentice-Hall inc. Somon ET Schuster, Upper Saddle River*, New Jersey 07458, USA,770 p.
20. **Hassanein A.M.A. 2013.** Factors Influencing Plant Propagation Efficiency Via Stem Cuttings. *Journal of Horticultural Science & Ornamental Plants*, 5 (3): 171-176.https://dx.doi.org/10.5829/idosi.jhsop.2013.5.3.1125.
21. **Husson O., Charpentier H., Michellon R., Razanamparany C., Moussa N., Enjalric F., Naudin K., Rakotondramanana & Seguy L. 2012.** Fiches techniques plantes de couverture : Légumineuses pérennes,

Arachis pintoï et *Arachis repens.* Manuel pratique du semis direct à Madagascar, Volume III, Chapitre 3, § 2, 12 p.

22. **KengueJ. & Tchio F. 1994.** Essais de bouturage et de marcottage du Safoutier (*Dacryoides edulis*). In: Kegu J, Nya Ngatchou J (Eds). Le Safoutier - the African Pear.Actes du Séminaire régional sur la valorisation du Safoutier, Douala, 4-6 octobre, pp. 80 - 98.
23. **Kouadio K., Dibi N.H., Bomisso L. & Ettien K.B.R. 2013.** Effet de l'intensité de l'ensoleillement sur la croissance initiale en pépinière de *Guibourtiaehie* (A. Chev.) Leonard (Caesalpiniaceae), espèce couramment exploitée et menacée d'extinction, dans l'Unité de Gestion Forestière de Bossematié (Côte d'Ivoire). *International Journal of Biological and Chemical Sciences*, 7 (6): 2292-2300.
24. **Kouadio Y.P., Egnankou W.M., N'guessan K.E., Zouzou M. &Aké-Assi L. 2009.**Contrôle de l'enherbement sous bananeraies au moyen de légumineuses de couverture dans la zone de Dabou, Côte d'Ivoire. *Agronomie Africaine*, 21 (3) : 287-298.
25. **Kouamé M.L.O., Egnankou M.W. & Traoré D. 2009.** Ordination et classification de la végétation des zones humides du sud-est de la Côte d'Ivoire. *Agronomie Africaine*, 21 (1) : 1-13.
26. **Melfort C. 2010.** « SIMSERV » un système expert d'aide à la sélection de plantes de service pour différents contextes agroécologiques et socioéconomiques. Rapport de stage à INRA, France, 30 p.
27. **Muanda F.N. 2010.**Identification de polyphénols, évaluation de leur activité antioxydante et étude de leurs propriétés biologiques. Thèse de Doctorat de l'Université Paul Verlaine-Metz, France, 239 p.
28. **Paluku A., Okungo A. & Bwama M. 2018.**Bouturage de *Cola acuminata* (P. Beauv.) Schott & Endl. : Influence du substrat, de la longueur et de la surface foliaire sur l'enracinement de boutures à Kisangani, RD Congo. *Journal of Applied Biosciences*, 123: 12354-12362. https:// dx.doi.org/10.4314/jab.v123i1.4.
29. **Peter H.R. & Ray F.E. 2000.**Biologie végétale. Edition De Boeck, Université Paris, France, 564 pp.
30. **Rosenn L.P. & Denis R. 2004.**ABC de la bouture. RUSTICA Edition, 223 p.
31. **Sanou J., Bazie H.R., Dao M.C.E. & Bayala J. 2017.** Weeds control through tree-crop associations in a parkland of Burkina Faso. *International Journal of Biological and Chemical Sciences*, 11 (2): 623-639.https://dx.doi.org/ 10.4314/ijbcs.v11i2.8.
32. **Tano E.J., Kouadio Y.P., Gnonhouri G.P. & N'Guessan K.E. 2016.** Inventaire floristique et effet de la densité de culture sur l'enherbement en bananeraie de type plantain (M*usa paradisiaca*) dans deux zones de production (Azaguié-Abbè, région de l'Agnéby-Tiassa et Eboissué, région de l'Indenié-Djuablin) de la Côte d'Ivoire. *AgronomieAfricaine*,28 (3) : 53-67.
33. **Tardy F. 2015.**Caractérisation fonctionnelle des stratégies de compétition pour les ressources aériennes et souterraines au sein d'une gamme d'espèces végétales : application à la régulation biologique des adventices par les plantes de services dans l'agrosystème bananier antillais. Thèse de Doctorat d'Ecologie fonctionnelle et sciences agronomiques, Collège Doctoral du Languedoc-Roussillon, Université de Montpellier, France, 180 p.
34. **Tilman D., Cassman K.G., Matson P.A., Naylor R. & Polasky S. 2002.** Agricultural sustainability and intensive production practices. *Nature* (London), 418 (6898): 671-677.
35. **Tixier P., Lavigne C., Alvarez S., Gauquier A., Blanchard M., Ripoche A. & Achard R.2011.**Model evaluation of cover crops, application to eleven species for banana cropping systems. *European Journal of Agronomy*, 34: 53-61.
36. **Toudou D.A.K., Atta S., Inoussa M.M. & Bakasso Y. 2017.** Mécanisme de tolérance à la sécheresse du niébé pendant la phase végétative. *Journal of Applied Biosciences*, 117: 11737-11743.https://dx.doi.org.10.4314/jab. v117i1.10.
37. **Touré Y., Koné M., Silué S. & Kouadio Y.J. 2013.** Prospection, collecte et caractérisation agromorphologique des morphotypes de vouandzou [*Vigna subterranea* (L.) Verdc. (Fabaceae)] de la zone savanicole en Côte d'Ivoire. *European Scientific Journal*, 9 (24): 308-325.
38. **Tsobeng A., Tchoundjeu Z., Kouodiekong L. & Asaah E.2011.** Effective propagation of *Diospyros crassiflora* (Hiern) using twing cuttings. *International Journal of Biosciences*, 1 (4): 109-117.
39. **Tubiana L. & Jacquet P. 2008.** Regards sur la Terre. Presses de Sciences Po, Paris (France), 288 p.
40. **Urban L. & Urban I.2010.** La production sous serre. In: Editions Tech & Doc,Paris, 2e Ed., 336 p.
41. **Zida W.A., Bationo B.A., Some A.N. & Bellefontaine R.2018.** Multiplication végétative par bouturage et marcottage aérien de trois espèces agroforestières au Burkina Faso. [En ligne] *VertigO - la revue électronique en sciences de l'environnement*, 9 (2).https://doi.org/ 10.4000/vertigo. 20921.